The American School and University

A YEARBOOK DEVOTED TO THE DESIGN, CONSTRUCTION, EQUIPMENT, UTILIZATION, AND MAINTENANCE OF EDUCATIONAL BUILDINGS AND GROUNDS

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PLANNING THE SCHOOL PLANT PROGRAM

By RAY L. HAMON

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THE school plant is an educational tool, and its nature can be determined only in terms of its use. The first step in planning the public school plant program is to determine the scope and nature of the services for which a physical plant is needed. This involves an analysis of the total educational, cultural, social, recreational, and health services to be provided at public expense for all age groups; and the determination of the extent and nature of these services which will be included in the program of public education. No community or unit of school government can plan intelligently its school plant program without first considering these fundamental long-range socio-economic issues.

What Are the Services To Be Housed?

It is obvious that the public schools of the future will expand their programs vertically to accommodate the needs of groups formerly considered "preschool" and "out-of-school youth." Schools will also expand horizontally to provide services heretofore unavailable or formerly provided by other agencies. Children acquire much of their education through contacts with home, church, public library, public playgrounds, public health, picture shows, activities of civic bodies, and many other private and public agencies. It is not the purpose here to discuss the extent that public schools should replace or supplement other agencies in providing education, recreation, and health services for children, youth, and adults. The answers to these questions will change from time to time and vary for different localities. Suffice it to say that the relation of schools to other educative agencies will affect the school programs and hence the planning of physical facilities for housing the programs.

American education is based on the needs of the people in a democracy, and education cannot remain static and serve the needs of a dynamic society. Curricular revision, based on social and economic studies, is a continuous process and forms the basis for planning the school plant program. The plant planner, therefore, must be a student of educational philosophy if the school plant is to function as an educational tool. Since school plants must serve for several years, those responsible for their planning must guard against the extreme views of tangent groups and must predict the survival values of both tried and new ideas in terms of public support.

What Are Logical and Effective Administrative Units?

School plant programs must be planned in relation to future local school administrative units. A plant program based on the present local district organization would, in thousands of communities, freeze an inefficient, ineffective, and obsolete school system for another generation. Several studies have been made to determine the minimum size of satisfactory local school administrative units. It is generally agreed that an administrative unit should include a total population of at least 50,000 or a school enrollment of 10,000. It requires a large school district in order to provide economically the special administrative, supervisory, counseling, health services, and curricular offerings essential to a comprehensive program of public education. Natural barriers and sparsity of population may in some cases make it advisable to create administrative units of less than 10,000 pupils, but this minimum standard should be observed where possible.

Administrative units should insofar as possible conform to trade areas and include a natural trade center. As large efficient administrative units are created, it is important that they be contiguous so as not to leave intervening areas too small and too poor to support adequate educational programs. In most states the county is usually the logical local school administrative unit, especially if the county seat is the principal trade center and is served by radiating county roads. Many counties, however, are entirely too small to serve as efficient school administrative units. It may be advisable in some cases to create school administrative units consisting of all or portions of two or more counties.

With the growing tendency to increase state support of schools and the possibility of federal financial assistance, local tax base becomes of decreasing importance in determining local units for the support and administration of schools. Since, however, some local effort is basically sound, local support should be distributed over a large local unit. The creation of city school districts, restricted to small urban areas of concentrated wealth, has tended to discriminate between the educational opportunities of urban and rural pupils. Cities certainly should be willing to share the common area wealth for the education of all boys and girls within their trade areas.

During the past generation there has been a general population shift to suburban areas of cities. In some cases urban school opportunities have been extended to suburban children either by city annexation or by enlarging the city school district to include the metropolitan areas beyond the corporate limits. In many cases, however, the suburban populations must depend upon lower-tax-base rural school systems for the

schooling of their children, even though their socio-economic interests are common with the cities. This situation often results in duplicating school facilities and in illogical school attendance units. In many cases county pupils are transported past city schools to a county school on the other side of the city.

It cannot be stressed too strongly that school plant programs can be planned intelligently only in terms of logical and effective local school administrative units. This principle applies to both rural and urban areas.

Determining Attendance Areas and Centers

If local school administrative units are sufficiently large for the efficient and effective operation of school programs, they will, with but rare exceptions, include several attendance areas. Usually administrative units are determined first, then divided into informal attendance areas which can be changed as conditions warrant. There would be some advantages, however, if attendance areas and centers were determined first, then the attendance areas grouped into logical administrative units.

The first step in determining attendance centers and the area to be served by each is the preparation of spot maps showing the residential distribution of pupils, by age groups, in relation to present and future streets, roads, natural barriers, transportation facilities, and existing school plants. Spot maps might be made in connection with the school census, and should include children and youth from birth to twenty years of age with different symbols or colors for different age groups, such as preschool, elementary, and secondary.

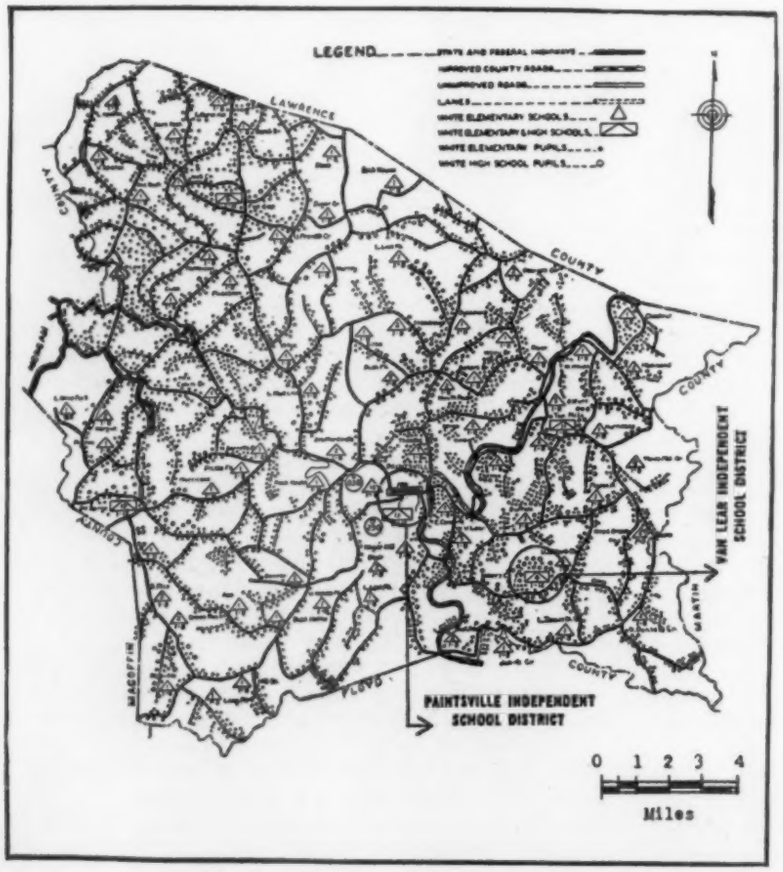
Pupil spot maps should be supplemented by maps showing population trends, saturation, residential and commercial zones, and probable new areas of residential development. It is important that such studies be made in close cooperation with zoning commissions, departments of vital statistics, highway departments, utility companies, real estate boards, park commissions, and over-all community planning agencies.

Attendance areas and centers cannot be determined until policies have been established regarding type of organization, size of school, pupil travel time, and extent of transportation to be provided.

Type of Organization and Size of School

There is but little justification for any specific grouping of grades. In fact, under some conditions, all pupils from the nursery school through junior college might very well be housed on the same campus and utilize certain facilities in common. Age or grade grouping is largely a matter of administrative and housing convenience. The typical 8-4 type of organization of a generation ago is still serving effectively in many localities, but there has been a tendency to change to a 6-6 organization in rural areas and to a K6-3-3 organization in urban schools.

With the growing emphasis on nursery schools, kindergartens, and youth programs, the conventional 12-year public school system may be extended in some



Maps, locating pupils, schools, charting transportation routes, and district boundaries, aid in the intelligent planning of a school plant program

communities to 15 or 16 years. The extended programs may begin with the four- or five-year olds; and be continued through the 13th and 14th grades, at least for a terminal curriculum of less than college grade. The 15 or 16 years might be grouped in a number of different types of organization such as 5-5-5, 7-4-4, 4-4-4-4, or 5-6-5. When the extent of the educational program has been determined, each administrative unit will naturally consider the availability and location of existing plant facilities in deciding upon the type of organization. The organization adopted by each unit will, in turn, affect the future plant program.

There is no single answer to the much discussed question of optimum size of school. There are rural schools in America with as few as three pupils, and there are city high schools with enrollments of over 10,000 pupils. The trend probably will be toward larger rural schools and smaller city schools. The most generally accepted desirable standard for rural schools is one teacher for each elementary grade and four teachers for each high school grade, provided pupils are not required to spend more than one hour in total one-way travel time between home and school. Although several two-teacher and maybe even a few one-teacher schools will have to be maintained in some areas, there are now entirely too many of these small schools. The charge is sometimes made that schools have been over-consolidated. This may be true in rare cases of super-consolidations; but, by and large, there is need for further consolidation of rural school attendance centers.

There is but little, if any, evidence to indicate that financial economies or educational advantages result from elementary schools larger than 700 or high schools larger than 1500 pupils, especially if it increases transportation.

There is considerable planning in some states for area vocational schools or technical institutes. Certainly educational services of less than college grade are needed for youth beyond high school age. It is hoped, however, that such programs can be operated as extensions of regular public secondary education. Some situations may justify separate attendance centers for vocational and technical education, but there are many advantages to be gained by providing these programs in the same buildings or at least on the same campuses with the regular high schools.

Costs and Financing

Any realistic plan for a school plant program must include a plan for financing the program. A financial plan should include a budget by projects for professional services, site acquisition and improvement, the different building contracts, equipment, and furniture. The plan of financing should also include the sources of funds and means of meeting future obligations incurred because of the building program.

There are many methods of comparing costs of school buildings and estimating the costs of contemplated buildings. The most common unit measure is cost per cubic foot. The cubage of a building has but little relationship to functional adequacy but will no doubt be continued as the principal unit measure of cost because its method of calculation is quite objective and generally understood by architects, engineers, and contractors. Other unit measures sometimes used are cost per square foot of floor area, cost per teacher station, and cost per pupil. In the preliminary stage of over-all plant program planning, estimated costs are usually based on teacher or pupil capacity.

There is no established optimum relationship among the different cost factors of a school plant. A tentative budget for new plants might be based on the following break-down: land and site improvements, 10 per cent; professional services, 5 per cent; furniture, 10 per cent; general construction, 55 per cent; heating and ventilating, 12 per cent; plumbing, 4 per cent; and electrical, 4 per cent. It is obvious, however, that this cost distribution will not conform to all conditions; for example, land costs will vary greatly and be affected by whether or not existing improvements must be purchased and razed, and actual furniture costs will be about the same for a low-cost semi-permanent building as for an expensive fire-resistive structure with similar spaces.

It is unfortunate that most school buildings have been erected during periods of inflation and paid for during periods of deflation. Financing plant programs by sinking-fund bonds has in most localities been discontinued in favor of twenty-year serial-bond financing. Long-term financing should be discouraged, because it tends to restrict future construction which may be as essential as immediate projects. If possible, school plant bonds should be limited to ten-year serials with retirement payments commencing the first year after issue. Short-term amortization will be even more essential if the apparent trend continues toward a less-permanent type of construction.

With larger local school administrative units, pay-as-you-go plant financing will become more feasible, and should be encouraged. If extensive school plant construction must be financed entirely from local funds, however, bonding will be necessary in most communities which have not accumulated building reserves.

During the past generation there has been a general trend toward greater state support of public education; but state funds, with rare exceptions, have been available only for current expenses. In some states small allowances have been made for the construction of consolidated schoolhouses, but only recently has there been a pronounced trend toward substantial state aid for capital outlay.

State financial assistance to local school administrative units for the construction of school plant facilities is essential if all of the children are to be provided with even reasonably adequate and satisfactory schoolhousing facilities. Long-range state participation in school plant financing may be coordinated with state aid for current expenses, but states should seriously consider the advisability of providing substantial *special* state financial assistance to districts for the construction of state-approved school buildings during the early postwar period. Some state legislatures are earmarking portions of state reserve funds for this purpose.

There is an increasing sentiment throughout the nation for federal financial assistance for the construction of school facilities. Federal aid for the construction of school plants should be apportioned to states according to an objective formula based on

need, ability, and effort. The flat-matching basis used in former public works programs was unfair to the communities in the lower economic brackets where the needs were the greatest. The principle of equalization should be applied to the distribution of state school plant aid to local school administrative units as well as to federal apportionment to states. Local units could plan their plant programs more specifically and intelligently if the federal and state governments would establish permanent policies regarding financial assistance for school plant construction.

Who Should Do the Planning?

The achievement of a functional, durable, economical, and beautiful school plant requires the cooperation of many specialists and the mutual adjustment of different interests.

Teachers, supervisors, administrators, and plant operation and maintenance personnel should be given opportunities to contribute ideas and suggestions when school plants are being planned. Suggestions should also be solicited from lay groups interested in the use of school plants for community services such as Parent-Teacher Associations, Boy and Girl Scouts, Future Farmers of America, public recreation, and public forums.

Many of the larger local school administrative units include on their professional staffs school plant specialists or educational plant consultants whose functions are to study educational housing needs and to coordinate the plant requirements of the different areas and departments into a total and continuous plant program. This type of permanent local service is very valuable and should be provided in administrative units contemplating extensive programs of school construction.

About half of the state departments of education maintain school plant services to review locations and plans, to assure that state codes and regulations have been met, and to provide consultative services to local school administrators, boards of education, and architects. Such services result in benefits to children and taxpayers by promoting properly located and functionally planned buildings at reasonable costs. It is urged that all states establish school plant services. Many of the states now maintaining schoo lplant consultative services will need to increase their personnel to answer the growing demand for these services by local school officials and architects.

Oftentimes local school authorities require more specific and detailed school plant services than can be provided by state departments. If the local school plant program does not justify the full-time services of a permanent educational plant adviser, it is advisable in many cases to call upon college and university staff members qualified in this field for school plant consultative services to supplement the services available by local personnel and from the state. All suggestions and recommendations from all the foregoing sources should be channeled to the local superintendent of schools who should prepare or approve the final recommendations to the local board of education covering the over-all plant program and the specific space allotments and educational requirements of individual projects. When approved by the board of education, the detailed statement of space allotments and educational requirements is ready for transmission to the project architects for the preparation of preliminary floor-plan sketches to be submitted to the superintendent of schools and his advisers for review and suggestions.

Paying for Architectural Services

Too much stress cannot be placed on the importance of the architect in the school plant program. It is he who must coordinate the services of all the special engineers and produce a total design incorporating the educational requirements in a pleasing structure conforming to state and local codes. All this he must do under the direction of the educational authorities and within the limits of a fixed budget. The successful performance of these functions calls for the highest degree of managerial ability, artistic talent, technical skill, and professional integrity. Without these qualities in the architect, the educational plant will be a disappointment.

Architectural services may be provided by state or local salaried employees or by architects retained on a fee basis. The retainer-fee agreement with private architects is the usual method. Special engineering services may be provided by the owner's salaried engineers, by separate fee arrangements, or by including these services in the project architect's agreement. Field supervision may be provided by the architect or a resident engineer in his employ, or a "clerk-of-the-works" may be employed by the owner. The important thing is to make specific provision for all of these necessary services and to channel them through the architect for coordination.

It is difficult to determine the monetary value of good architectural services. Good architects are worth more than they are usually paid, and poor ones would be expensive if they worked for nothing. In justice to both architects and the public, agreements with architects should be in writing and indicate very clearly the amounts and conditions of payments and the architect's specific relationships to such services as the preparation of preliminary sketches, working drawings, specifications, and detailed drawings; and the checking of shop drawings, approval of materials, field supervision, and structural, electrical, mechanical, and landscape engineering services.

SOME QUESTIONS ABOUT SCHOOL ORGANIZATION AND THE SCHOOL PLANT

By JOHN GUY FOWLKES

Professor of Education and Dean of the Summer Session, The University of Wisconsin, Madison, Wisconsin

A SCHOOL plant is merely the biggest single piece of learning equipment essential for a good school system. To be sure, a school building, like all other working quarters, has a primary function of housing, but most especially, the facilities of size and arrangement of the component units of a school building must reflect the educational needs which are to be met by a given school system.

Too often school buildings are planned without due regard to the ages of people that are to be served, the various kinds of educational offerings that are to be made available, and the particular pattern of school organization that is to prevail. Just as the variety of ages and the particular educational program have marked relationship to a school building, similarly, these factors also affect greatly the pattern of organization in a local school system. In effect, therefore, the influence of the organization of a school system on the school plant cannot be considered validly until who is to be served and what is to be offered are also given attention.

Who Is To Be Served?

The early concept of the population that needed to be served by the schools of a local community was a decidedly limited one in contrast with contemporary practice. Even our compulsory attendance laws throughout the country, which on the whole provide for eight years of schooling, reflect a much lower level of education than is recognized as essential by a sharp majority of our local communities. High school opportunity for all at public expense is now accepted throughout our nation. There is growing evidence that local schools must also take care of three-, four-, and five-year olds and adults if basic educational needs are to be served. Consequently, in establishing a pattern of over-all organization for a local school system, it is clear that cognizance must be taken of the age levels for which school opportunity is to be offered.

It is highly essential that school buildings reflect specific planning for the particular age groups of people that are to be served. Very few school buildings at present have appropriate facilities for programs of adult education. Practically none of our elementary school buildings are designed or equipped to take care of children under five years of age. As a matter of fact, even in many communities that have kindergartens, the quarters for such kindergartens as well as the rooms for the first and second grades are ill-suited, indeed, for the type of educational opportunity that should be offered for these early age groups.

Courtesy of Rochester (N. Y.) Public Schools



". . . the philosophy of the kind of schooling that should be available has changed. No longer are the "three R's" alone acceptable." Thus, in many schools, facilities are outmoded

What Is To Be Offered?

Just as the philosophy of what age groups need local school opportunity has changed, so also the philosophy of what kind of schooling that should be available has changed. No longer are the "three R's" alone acceptable as an adequate educational program. Particularly for those people over fifteen years of age is this true. Although general education still is, and must be, one of the major functions of any school unit, it must be recognized that general education must include development of the hand and development of social ability, as well as development of



Courtesy of National Education Association

"Too often school buildings are planned without due regard to the ages of the people that are to be served"

the mind. Furthermore, the necessity for pre-vocational and vocational training must be met by local school systems for relatively large numbers of people for whom the high school or junior college is still the last formal educational experience.

Laboratory facilities, especially with respect to household arts, commercial arts, industrial arts, and agriculture, demand very careful planning at all levels. The school building handicap under which an attempt is made to offer educational opportunity in these fields is the most forceful argument that could be advanced for the need of careful plant planning in connection with these fields.

How Many Are To Be Served?

As has previously been implied, the over-all organization of a local school system should be determined on the basis of who is to be served and what is to be offered. Similarly, the number of people to be served should sometimes play a major part in the establishment of an over-all local school organization. Some of the specific questions that should be carefully considered in the development of a pattern of over-all organization are:

Shall there be nursery schools?
Shall there be junior high schools?
Shall there be senior high schools?
Shall there be a junior college?

After these questions have been seriously pondered over, the question then arises as to whether these units shall be housed separately or together and the extent to which it is desirable and practical to keep these various units housed separately or collectively.

Plans of Over-All Organization

Up to approximately 1920, the 8-4 plan of organization was found most frequently, as is still the case. The 8-4 plan obviously did not recognize the need for kindergartens nor a need for a junior college. Between approximately 1920 and 1930 the junior high school as a separately housed unit made its appearance throughout the country. Roughly, during the decade 1930 to 1940 the trend towards the separately housed junior high school eased, and school buildings housing the last six years, namely, grades seven through twelve, made their appearance in many sections of the country. In the relatively few communities that have established junior colleges in connection with the local high schools, practice of separate or collective housing of the high school and junior college is varied.

Too few communities have attempted to establish nursery schools as integral parts of the public school system to make any generalized statement concerning this latest development in our system of public education. Some communities, as for example, Dearborn, Michigan, are experimenting with the construction of small school buildings which will take care of children in the three- to seven- or eight-year group. The belief is held in some quarters that relatively small outlying schools for these younger age groups can be built and operated at considerable saving without any

serious effect on the educational experience enjoyed by the children.

Whether the school plant organization of a local school system should be the 7-6, 7-3-3, 4-4-4-4, or one of the other possible commonly found arrangements must be decided in terms of who is to be served and the kind of educational opportunity that is to be offered. By and large, it seems sound to say that, if a community is not to have a junior college, all things considered, the six-year secondary school building is more efficient both educationally and financially than separate buildings for grades seven, eight, and nine and ten, eleven, and twelve. This is especially true in communities having populations under 100,000.

It should be remembered that a school building which provides for six years of secondary school opportunity does not necessitate the organization of a single six-year school unit. Many communities have found it very satisfactory to organize and operate a junior high school composed of grades seven, eight, and nine and a senior high school of grades ten, eleven, and twelve, both of which are housed in a single school building, but which operate on separate and different daily schedules.

Organization of Individual School Buildings

Even after the over-all pattern of school plant organization has been established, certain problems of the individual school building will inevitably arise. Some of the more important of these problems are:

Shall there be a separate technical high school?

Shall the school which houses children from three to six years of age be housed separately?

In the school building which houses six years of secondary school, shall two sets of administrative offices be provided?

In the school building which provides for the last two years of high school and two years of junior college work, shall two sets of administrative quarters be provided?

To what extent does collective housing of junior and senior high school pupils or high school and junior college students necessitate increasing physical education facilities?

The general thesis for dealing with these questions is that the richest possible educational opportunity should be offered at the least necessary expense. If there is an educational or social reason for separating various groups of students which are housed in a single building, full provision should be made for separate administrative offices of the various groups. Also, collective housing of students in a single building should in no way limit necessary facilities for all essential educational experience.

Particular care should be exerted in arrangement of rooms for all buildings that are to house relatively wide spans of age groups. Similarly, in establishing daily schedules, great care should be taken in allocating and assigning rooms. In many communities where a single building houses grades seven through twelve, practically all of the classroom work for grades seven, eight, and nine is done on one floor and practically all of the work for grades ten, eleven, and twelve done on another floor, with alternate use being made of shops, laboratories, cafeteria, and gymnasium.

No Magic Formula

Such seem to be some of the major problems that arise in connection with school organization and the school plant. The particular answers to these problems in relation to a given community must be worked out by all concerned in terms of what best meets local school needs. The writer knows no magic formula which will fit any and all situations.

PLANNING THE COMMUNITY SCHOOL FOR PRACTICAL SERVICE

By N. L. ENGELHARDT

Associate Superintendent of Schools, New York City

THE educational center of gravity of the world is in the process of being relocated. Over the centuries it has moved constantly westward and now it is about ready to jump across an ocean. Here in the United States, the physical plants devoted to education have remained intact, the program of scientific and educational advance has not been impaired, and the vision of future possibilities and responsibilities has been clearly seen by our leaders. The expansion of educational opportunities in this country is inevitable. In fact, the demand is imperative. This expansion will occur not in higher institutions of learning alone; it has become the obligation of every community large and small. The facilities for such broadening of educational growth must be found in the community school as well as in other community buildings devoted to the intellectual, social, and vocational improvement of our people.

Peace and Understanding Depend on Education

Let us bear in mind that our national pronouncements to the citizens of the world have stressed a kind of human relationship upon which our hope for a better world is predicated. The doctrines of equal opportunity, freedom of thought and action, protection of the individual, etc., have been spread everywhere as democratic fundamentals in which we sincerely believe. Not only have we expressed our intent to carry out these democratic principles in our own practices, but, through our suggestions and guidance, world-wide acceptance of "the American way" has been considered eventually possible. Neither of these aims can be achieved except through the greater enlightenment of our own people. World leadership, or even participation in world betterment, entails, as primary requisites, self-improvement; elimination of provincialism; substitution of knowledge for hearsay and bias; recognition of achievements without regard to race, color, or creed; and continued educational upgrading of the most competent as well as the most underprivileged.

World peace and understanding will be brought about through countless educational gains made here, there, and elsewhere. Victory for peace is not achieved through mass concentrations of trained forces at the battlefronts with the home front as the secondary line of defense. Victory for peace is the resultant of individual and community group action throughout the land. As individuals grow in their understanding of world problems, and as communities set patterns for better intercultural relations, for improvement of opportunities for all, and for support of acceptable world policies, the forces opposed to war and other unenlightened world practices will gather their strength.

The struggle for realization of humanitarian principles will be long and difficult. The success of the struggle rests in large measure in the release and capitalization of intellectual capabilities which have lain lethargic and which may be expected, under new stimulation, more nearly to achieve their potentialities.

Horizons of Individuals Expand

Today, the community is still the place in which a man lives and works, but transportation and communications have transformed his relationships to the wider circles of state, nation, and the world. His thinking, his food, his clothing, his shelter, his employment are all conditioned by world developments. In the past, John Doe was familiar with his neighborhood, the local stores, the nearby trout stream, and his place of employment. His friends confined their discussions to local, state, or national problems. In the future, Mr. Doe will find it desirable and advantageous systematically to learn about the world, his new neighbors in hitherto distant lands, their places of employment, their contributions to the arts and the sciences, and their problems of food-getting or shelter construction. Mr. Doe's friends will more and more desire to center their discussions about the philosophies, the research contributions, or the literature of other peoples, formerly considered as a part of another world. Radio, motion pictures, television, and ever-expanding use of the printing-press will promote this movement of release of man from his past narrow environment.

Educational Restrictions Vanish

Winning World War II has placed new obligations on all American citizens. More intensive and extensive education, and the full application of such learning, should provide the means for meeting those obligations. Certain widely-accepted notions restricting educational opportunities are rapidly disappearing. Among these are the following: (a) that organized educational programs ceased after graduation from high school or college; (b) that training for a vocation had a degree of finality about it; (c) that only limited numbers should be privileged to enjoy a college education; (d) that subject matter had a divinely graded placement in the educational framework; (e) that school building use should be limited to the traditional school hours; (f) that education could be advanced only through regulations covering pre-requisites,

credits, fixed hours, and semesters. The needs of communities as well as of individuals now guide the administrator in planning the school's offerings.

Every American school should be developed as a real community school. It is the center which, with proper coordination with other available community facilities, can usually best offer the advantages sought today by adults and children alike. Where buildings have not been designed for this extensive service, adaptations should be made as funds permit. New buildings, whether in the elementary or secondary range, should definitely be planned for the most liberal kind of community program. There seems to be no alternative except the duplication of facilities or their dispersal in such a way as to produce less effective results. The needed kind of community school is in the process of evolving. The nature of the facilities may determine the program as well as the results accomplished. Many a school program today is restricted by building handicaps.

Community leaders will find it advantageous to prepare the outline of what the new community educational program should be like. Possibly they would want to improve understanding in the following areas: intercultural relations; music, art, and literature of all peoples; food, clothing, and houses of the world; advances in science and medicine; world sociological, economic, and political developments; geo-politics; new vocations; consumer education; problems of labor and management; local community problems; and common everyday needs such as parent education, home planning and building, vocational rehabilitation, cooking and sewing arts, and making household repairs. They would provide opportunities for discussion groups, for conferences, for access to books and motion pictures on social problems, for music and recreational activities of many kinds, and for vocational guidance.

A community school providing extensive opportunities like these for adults and corresponding offerings for neglected out-of-school youth as well as regular school attendants would be developing citizens skilled to carry on the problems of citizenship and the family, and competent to render service and to voice opinions in the larger realm of world relations. Building facilities planned to make possible these opportunities would represent considerable variations from traditional conventional structures with their auditorium, gymnasium, and library stereotypes. The school building should permit and encourage the accomplishment of what society needs today for the preparation of thinking, alert, adjusted, skilled, well-rounded, and emotionally stable citizens.

Courtesy of Board of Education, Muskegon County, Michigan



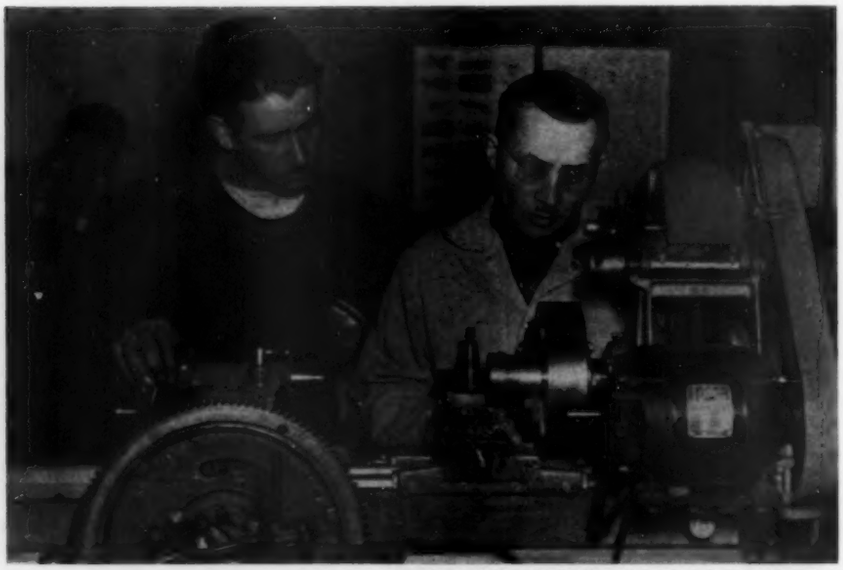
"New buildings . . . should be planned for the most liberal kind of community program"

Concepts Changing, But New Analyses Required

In a pamphlet issued by the Division of School Buildings and Grounds of the State of New York, called "Designing the Central School Plant as a Community Center," the prewar pattern of community needs was depicted as follows:

"Such community organizations as the following will need a suitable place for their activities: Grange, Farm Bureau, Home Bureau, 4-H Club, Red Cross, Junior Red Cross, Boy Scouts and Cubs, Girl Scouts and Brownies, parent-teacher organizations, service clubs, forums, community athletic teams. Other groups can be named. In addition, adult groups may use the school plant for classes in homemaking, farm machinery repair, physical education, and other courses and activities.

"Activities to be taken care of in the school plant—some connected with the foregoing organizations





Courtesy of Board of Education, Eastchester, New York



Extent of the community program depends on the convenience and adequacy of the facilities

others not—include: group meetings, banquets, dramatic entertainment, adult education classes, dancing, musicales, operettas, motion picture shows, public library, and such games as basketball, volleyball, badminton, baseball, horseshoes, softball, ping-pong, and various other table games.

"A Saturday 'nite club' or 'teen-age canteen' for high school pupils, sponsored jointly by school officials, pupils, and parents, may offer a fine outlet for social and recreational desires. This club is properly housed in the school building."

This pattern represents a splendid step forward for a state department of education as far as the commonly recognized school-community needs are concerned. Here is given as much emphasis to what were formerly fringe school activities as to the recitation work in specific subjects. Each state will, however, render an essential service by definite analysis of the kind of citizen new world conditions demand and will express concisely how school facilities can be planned to contribute to this end.

Community School Must Be Practical

Determination of the program to be served and the spaces to be included does not ensure success in building planning unless the many considerations that result in proper location and juxtaposition are given early emphasis. An auditorium located on a second floor has its value largely reduced. A gymnasium remotely related to outdoor play areas, or improperly

designed to handle large groups of spectators, is a "poor buy." Shops not usable for adult classes, or not in line with production shop practices, tend to lie vacant. A cafeteria placed in a basement area may not satisfactorily serve the social functions of the community. Thus, concentration in planning should be upon the practical services to be rendered.

Approval of the excellence of a school plant centers frequently about the convenience and adequacy of its public utilities. Is handwashing possible in close proximity to the cafeteria? Is lighting sufficiently controlled to permit of use without excessive waste? Is heating zoned to enable use of one section of the building without heating the entire structure? Is current available for motion pictures where it will be needed? Are sewers of proper size and location to carry off rain water which might otherwise interfere with outdoor activities? When planning has failed to provide against interruption of use of facilities, the educational program itself suffers.

The auxiliary spaces required by each kind of educational activity may have a considerable influence on the real use of the school plant. If protective storage places are not provided for luncheon and kitchen purposes, less enthusiasm for community use results. If out-of-door theatrical groups can not have their equipment protected from the weather, their productions may become fewer and fewer. If adults making fine pieces of furniture in the shops find their work marred because of their inability to find safe storage for it, the future of this shop program becomes jeopardized. If adult groups working on the "food" problem of the world have no storage files for their charts, diagrams, and maps, another difficulty in administration is raised which the building planning should have foreseen.

In other words, the community school should be made completely practical. Its workshops, laboratories, and special instructional areas require spaces for safeguarding, segregating, and isolating materials and equipment so that each group may feel that its interests have been fully protected.

School Plant Should Set Community Standards

The community school plant, as far as funds permit, should represent the best in materials, construction, and equipment. It should thus symbolize the highest skills of man. It should set the standard for the rest of the community to strive to attain. Maintenance costs for such a building should be at a minimum because of the thoroughness of planning and the care exercised in the use of the plant. Part of the instructional program may well involve the individual's responsibility for community property. Attractive landscaping, pleasing interior atmospheres, freedom from interference among groups in the use of the plant tend to create respect for the center. Common property, used and protected by all, leaves a splendid impression of good citizenship that no doubt has its influence on other aspects of community living.

The community school of the post-World War II period has its scope defined in the broadest of outlines. In such school centers, the struggle for world peace may be decided—not, to be sure, in this nation alone; such centers should dot the world over. The site chosen should be in keeping with the magnitude of the educational problem. There are many needs to be met which sufficient land alone can safeguard: land for social and recreational mingling; land for experimentation in solving environmental problems; land for proper dispersal of structures, land for parking, for beautification, and for future protection. The community school should provide the inspiration to all citizens to continue their educational programs through the entire span of life. In this continued enlightenment of man lies the hope for a better world.

TRENDS IN EDUCATION SIGNIFICANT FOR SCHOOL BUILDING PLANNING

By H. L. SMITH

Dean, School of Education, Indiana University, Bloomington

ONE who speaks of trends in education should be somewhat guarded in his statements lest he be accused of wishful thinking. What we sometimes take to be a trend is merely a mirage, and disappears. A change or variation which in a particular community may seem important may have no general significance. On the other hand, a variation from the customary may seem of slight significance yet start a movement significant enough to be called a trend.

In the field of education we have many experimental deviations. Some of them soon die of inanition. But occasionally a new method, a new plan, a new kind of material or type of building proves to be useful, and gradually there develops a trend toward a general acceptance of the new. Very seldom, in education, do we have a sudden shift from the old to the new, from the tried to the untried. Generally speaking, education in a democracy is slow moving. In some cases it would seem that rapid acceleration would be highly desirable. On the whole, however, it is fortunate that we move slowly; that we have trends rather than sudden revolutions. Trends usually show a tendency or an attempt to meet a known social need, and, to meet this need, careful thought, planning, and preparation are ordinarily essential.

Designers Seek Expansibility and Flexibility

From the standpoint of schoolhouse construction it would seem necessary at this time, as we face a new situation and must meet new problems, to list and consider some of the trends in education, and to seek to ascertain what bearing these trends may have on the planning of new schoolhouses.

It will be noted that all the trends we list in the educational field as being significant for future building plans lead to a search for expansibility and flexibility. These two areas of building problems are closely allied, sometimes even interwoven. In the one case, there is an expenditure of more money for additional facilities to obtain desirable results; in the other, there is an attempt to get desirable results by a process of shifting, manipulating, and increasing the use of the facilities provided.

Flexibility in the area of school buildings is construction such as will lend itself to changes in size, arrangement of rooms, additions and subtractions, shifts in use to which the rooms or total building may be put, shifts in coloring and lighting of rooms, capacity for being used for heavy or light materials, and the like.

Flexibility in any particular school building does not "just happen." It must be *planned for* and *built into* the edifice. The capacity to be used for different purposes or in different ways is always a planned capacity. If a building has to be remodeled to be used in various ways, the quality of flexibility was not there originally but has to be added. The present-day trend is to put into every new school building as much of the quality or capacity of flexibility as is possible without being out of line with a satisfactory degree of beauty, economy, and stability.

Four Significant, General Trends

Of the trends we have selected to consider here, four seem to be general. They are common to all states, receiving, of course, greater emphasis in some than in others. They are all of universal importance.

Standards Are Being Revised Upwards

The first of these general trends is toward setting up higher, more definite standards in every area of education.

This trend may be in part the result of the spirit of rivalry among the leaders in the various subject matter fields. But it has back of it the feeling of nearly all teachers and administrators that education in all its fields has not by any means reached the goals it should and could meet; that in every field education should be on the march toward higher goals and toward greater efficiency. It has become more and more evident to leaders in education that it is absolutely essential that we first *set* higher goals in order to *reach* higher goals; and that our standards be not only movable but actually moved higher from time to time. There is the tendency also to make the standards much more specific and more complete. An illustration of this may be found in a set of standards soon to be published by the Physical Education Department of Indiana University. These standards cover in detail the various phases of the field: health, safety, recreation, etc. They cover also the types of equipment, the necessary facilities, the proper buildings and grounds, and various other items.*

Standards similar to these may be found in many other subject matter fields. Comparisons are being

EDITOR'S NOTE: This article was delivered as an address by Dr. Smith before the National Council on Schoolhouse Construction at Cincinnati, Ohio, October 1945.

* See page 177.

made, and from time to time changes upward are advocated.

The fact that standards are being steadily revised upward has heavy implications for schoolhouse construction. When standards are set by experts and are known by administrators and teachers and even by the community, it follows that school buildings must be planned specifically to meet definite and exacting standards. For example, in the matter of laboratories, in physics, chemistry, and agriculture, the results of research and the development of new products will demand new types of equipment and facilities and additional and rearranged floor space. It is to be remembered that in all areas there is not only a five-year accumulation of deficiency in new schoolhouse construction, but a five-year accumulation of ideas, discoveries, and inventions.

Elementary Education Assumes Rightful Importance

Another trend closely akin to the one discussed is a marked tendency to place all levels of education upon a parity of importance in matters such as quality of teachers, quality and adequacy of facilities, and curriculums.

Some years ago it was a too common notion that the elementary schools were of less importance than the high schools; that almost any kind of building, equipment, or even teacher was good enough for elementary schools. Standards of excellence were rarely heard of in this field. Sanitation, safety, comfort, convenience were given comparatively little consideration. Equipment was as meager as the methods of teaching were static. Gradually a change in attitude has come, so that today a most decided trend appears to lift the status of the elementary schools to a parity with that of high schools.

This trend will of necessity mean expansion of building programs. But it will mean more; it will mean modern plans to meet modern standards for elementary school buildings. Child life, child interests, and child welfare have come to hold such a high place in the public regard that nothing but the best in modern facilities will satisfy the community.

Equal Opportunity Becomes Lively Issue

Still another general trend is that of recognizing that all localities and all segments of the population should be on a parity in educational opportunities and facilities.

This trend has greatest significance for rural and poorer districts. State aid and federal aid will bring demands for consolidated schools planned especially for doing a definite type of work. Planning buildings for rural consolidated schools is a task that calls for farsightedness and some real ingenuity. We have scarcely scratched the surface in designs for adequate buildings in which to carry on a well-rounded, essential rural program. The field is practically unworked from the standpoint of school building plans insofar as meeting the new concept of rural school needs is concerned. Great expansion in building in this rural field is almost certain. The chief problem will be to get a proper conception of the developing needs.

Public Demands Share in School Facilities

The fourth general trend is to recognize more fully that the schools belong to the community and are a community investment and enterprise, and that the buildings, grounds, and equipment of the schools should be made available to the public as far as possible without conflicting with the school program.

Naturally this trend will break some hoary, traditional methods in administration. It will call for the burial of some antiquated notions. But if carried through it will be of great benefit to both school and community.

In this case there is definite need for flexibility in thinking as well as in buildings. Heretofore, schoolmen have too often taken the attitude that schools are an independent unit. But the people of the community are knocking at the schoolhouse door and demanding that they be sharers in the privileges and facilities of schools. They are claiming, and rightly, that they pay the taxes, construct the buildings, pay current expenses, and even, through their own school board, hire and pay the teachers. In order to meet this just demand, both school personnel and school buildings will need to become more flexible. Planners of school buildings will need to take account of the fact that school programs and community programs will have to run simultaneously at certain times and, at other times, one following the other.

Significant Trends in Special Areas

In addition to these four general trends we should like to mention a few others which have to do with particular areas of the educational field.

Expansion of Health Program

The first is the trend toward a fuller recognition of health, both physical and mental, as one of the most fundamental problems in the field of education. Generally speaking, the people are aware of some of the facts revealed by Army and Navy examinations and training programs. Hundreds of thousands of young men were rejected; many thousands more were accepted but later had to be hospitalized or discharged. The astounding facts and conditions revealed have led to a determination to develop a health and physical education program which will be both preventive and remedial. Such a program when it gets under way will demand an expansion in buildings and grounds and equipment unparalleled, perhaps, in our history. The expansion will be greatest in the elementary field where neglect of health and recreational facilities has been most noticeable.

Wider Offerings in Vocational Education

In the vocational area there is a rather rapid trend or movement to provide a much wider offering in vocational subjects and a much fuller training in a wide range of vocations. One can scarcely envision the expansion in this field, or the types of building plans that will be called for. When we consider the demands for training both sexes in so many different areas each of which calls for different construction plans, we can have some idea of the size of the task before us. In the two big fields of industry and agriculture the amount of floor space necessary to carry on proposed programs will seem to many to be unreasonably large. There will be less flexibility possible, perhaps, in buildings for these areas because of the necessity of installing heavy tool machines and housing large types of self-propelling machines such

as tractors, airplanes, trucks, bulldozers, and numerous large farm implements.

Other Trends

We have time here to mention only a few other trends significant to school building planning:

1. The trend in the construction of buildings, and also in landscaping of grounds, to strike a sensible medium between beauty and utility.
2. The trend toward higher standards in the matter of accessibility in buildings, rooms, equipment, and playgrounds.
3. The trend to provide for adults a larger number of courses in more fields and at less cost.
4. The rather rapid trend toward a greater use of audio-visual aids at all levels of education and in practically all subject fields.
5. The trend toward giving a larger place to the fine arts and industrial arts.
6. The trend to take a long-time view of building needs and to lay more emphasis on the expansibility and flexibility of buildings.

All these various trends we believe to be of significance in our facing of a heavy building program. The list is not exhaustive, of course, but may be sufficient to show the nature and size of the task to those who seek in school building planning to meet as adequately as possible the needs of today's and tomorrow's children and youth.

Preparation for "Go-Head" Should Begin Now

In the attempt to keep in line with all these significant trends in education and to be prepared to meet the demands of a rapidly expanding program it will be necessary in school building planning to lay a lot of groundwork and to work out and establish as soon as possible suitable standards in all areas so that, when construction of public buildings receives the go-sign, work can begin immediately.

At the last meeting of the National Council on Schoolhouse Construction we suggested for several areas a set-up of facilities to meet postwar building demands. These are available in the Report of the council and also in the *American School Board Journal* and need not be repeated here. Since that time, however, further increases in demands have come, especially in the fields of vocational education and adult education.

Examples of Flexible Construction

In connection with our study of trends and of the expansion necessary in the various fields, it might be



In planning industrial or agricultural shops, it is wise to anticipate future requirements. For example, even if there should be no immediate need for a heavy crane to handle big machines, the requisite overhead construction might be provided

From All the Children, 38th Annual Report of the Superintendent of Schools, City of New York

helpful to give some examples from different areas of the quality we have called flexibility.

In Health and Physical Education Rooms

In the area of health and physical education may be found several examples of putting the quality of flexibility into school buildings.

In the high school gymnasium in LaGrange, Illinois, there is a room, centrally located, used for multiple purposes. It is used by athletic teams as a lantern room where pictures of plays are shown; it is also used as headquarters for the Library Club. Wall cases are provided for book selections. At times it is used as a classroom for instruction in team plays.

Another large room in this building can be put to various uses. It has provision for vigorous varsity sports, it is available as an exercise room, it provides equipment and space for classes in restricted activities: by bringing in mats it may serve as a wrestling room. It is also available to the Boy Scout troops.

In another part of the building is a regular wrestling room, separated by a sliding door partition from a larger recreation room. In this wrestler's room there are observer's bleachers. Sliding back the partition opens this room into the larger one, making space for activities of large groups.

The large gymnasium room itself gives an example of flexibility. Cross courts in addition to the regular long court provide opportunity for several games at one time. There are also folding bleachers easily put back out of the way when certain activities are in progress.

In Nursery and Primary Schools

Many nursery schools are making use of the principle of flexibility in meeting the problem of handling groups of children in rather limited quarters. For example, in some schools there is a central room which serves several purposes. In the first part of the day it is used as a play and workroom. Then it is changed into a dining room where the room meal is served. Then cots are brought in, and the room becomes a bedroom. After naps the cots are removed, and the room is again a play and workroom.

Primary schoolrooms in many cases furnish examples of flexibility. The classroom is the home room and by certain shifts becomes the play and workroom, a lunchroom, a restroom for the rest periods, and a physical education room. Movable furniture is provided, and equipment can be shifted. A toilet room is also provided. The room is in many ways an independent school unit. In the Winnetka type of primary room, a door opens to an outside court or playground where outdoor activities are carried on.

In Vocational Buildings

In the plans for vocational buildings, a certain amount of flexibility will be called for. For example, in a new industrial or agricultural shop for a high school, there may be no immediate need for a heavy crane for handling big, heavy machines. However, it would be wise to provide the requisite heavy overhead construction so that at a later time a large crane could be installed.

In airplane shops and in agriculture shops the walls should be so constructed as to permit the installation of exceedingly wide doors for the entrance of wide-winged airplanes or wide farm implements.

In Audio-Visual Rooms

As an illustration of a set-up in a particular field where great expansion and flexibility of building plans will be necessary, we might cite the area of audio-visual aids.

In this area the functionalism theory seems to be dominant. All material of library-visual aids, audio-aids, and museums should be convenient to both teachers and pupils.

In each city or town there should be an audio-visual aid center, under one director, from which materials of all kinds may be distributed. Sub-units in each school (elementary and secondary) should also be provided.

In each school there should be a room where pupils can take visual aids material and use it—desks with electric outlets must be provided for individual pupils, so that they can use earphones and screen.

Each classroom should be adapted to all types of material: sound films, radio, exhibits. Proper acoustics, drapes, and shades must be provided. Each classroom, it is now being claimed by some, should show one film, one period per week, per subject.

For such work and for exhibits the classroom will definitely have to be enlarged.

In each school building there should be a miniature auditorium, perhaps three times the size of classrooms. This room would serve the following purposes:

1. It would serve as a supplementary music room.
2. It would provide a place for three or four classes to observe important films.
3. It could be used for preparation of broadcasting material.
4. It could serve as a broadcasting room and as a room for hearing FM programs.
5. It could be used for P.T.A. and other community meetings. It should therefore be accessible from the street.
6. It should include a control room and be equipped to make motion picture records for classes.

In large schools there should be a large auditorium completely equipped for showing films to large audiences either of school population or of adults.

In halls and corridors there should be modern exhibits that are changed frequently and are under the direction of a competent individual acquainted with the visual aids field.

There Will Never Be a Really Adequate Building

The one conclusion is this: The perfectly planned and used building does not and cannot exist. A finished product represents at best a static situation, hence necessarily a situation bordering on the edge of disintegration and decay, both physically and functionally. Our best hope is for a struggle for as nearly perfect and comprehensive goals or educational purposes as possible, recognizing the inevitable pressure for change that must be expected of every growing organism or institution. The school plant, with its equipment, is constantly under the necessity of modification and improvement. Change is imperative, and our search for adequacy and flexibility of structure and function is continuous.

COMMUNITY AND SCHOOL PARTICIPATION IN CINCINNATI BUILDING PROGRAM

By BETTY K. JOHNSON

Associate Editor, The School Executive, New York, New York

THE Cincinnati Board of Education authorized in 1943 a school building survey to be made jointly by the Bureau of Educational Research of Ohio State University and the Department of Research of the Cincinnati Public Schools. The survey was directed by T. C. Holy, director of the Bureau of Educational Research, of Ohio State University, and John H. Herrick, then director of research in the Cincinnati schools.

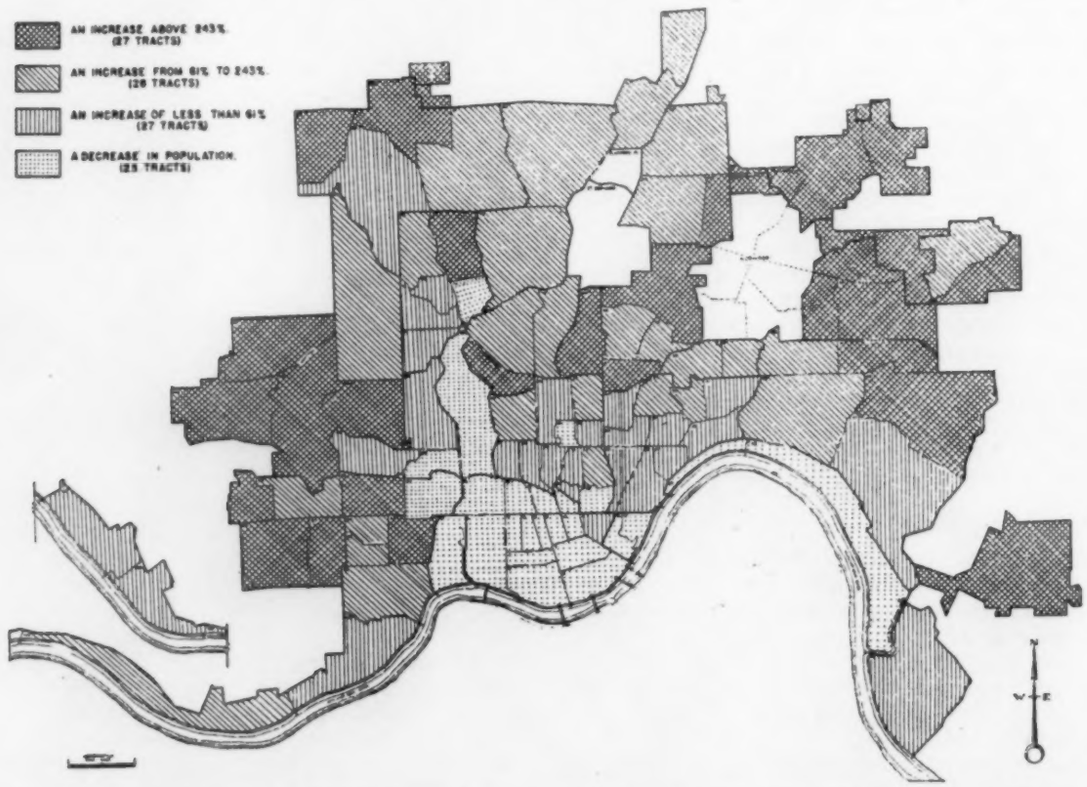
According to the original plans, the study was to lead to specific recommendations on: (1) existing buildings which needed to be enlarged, modernized, or abandoned; (2) existing sites to be abandoned or sold; (3) new buildings to be constructed; (4) the approximate cost of all these suggestions; and (5) a recommended means for financing the program.

NOTE: This article is prepared from materials furnished by John H. Herrick, Assistant to the Superintendent, Cincinnati Public Schools.

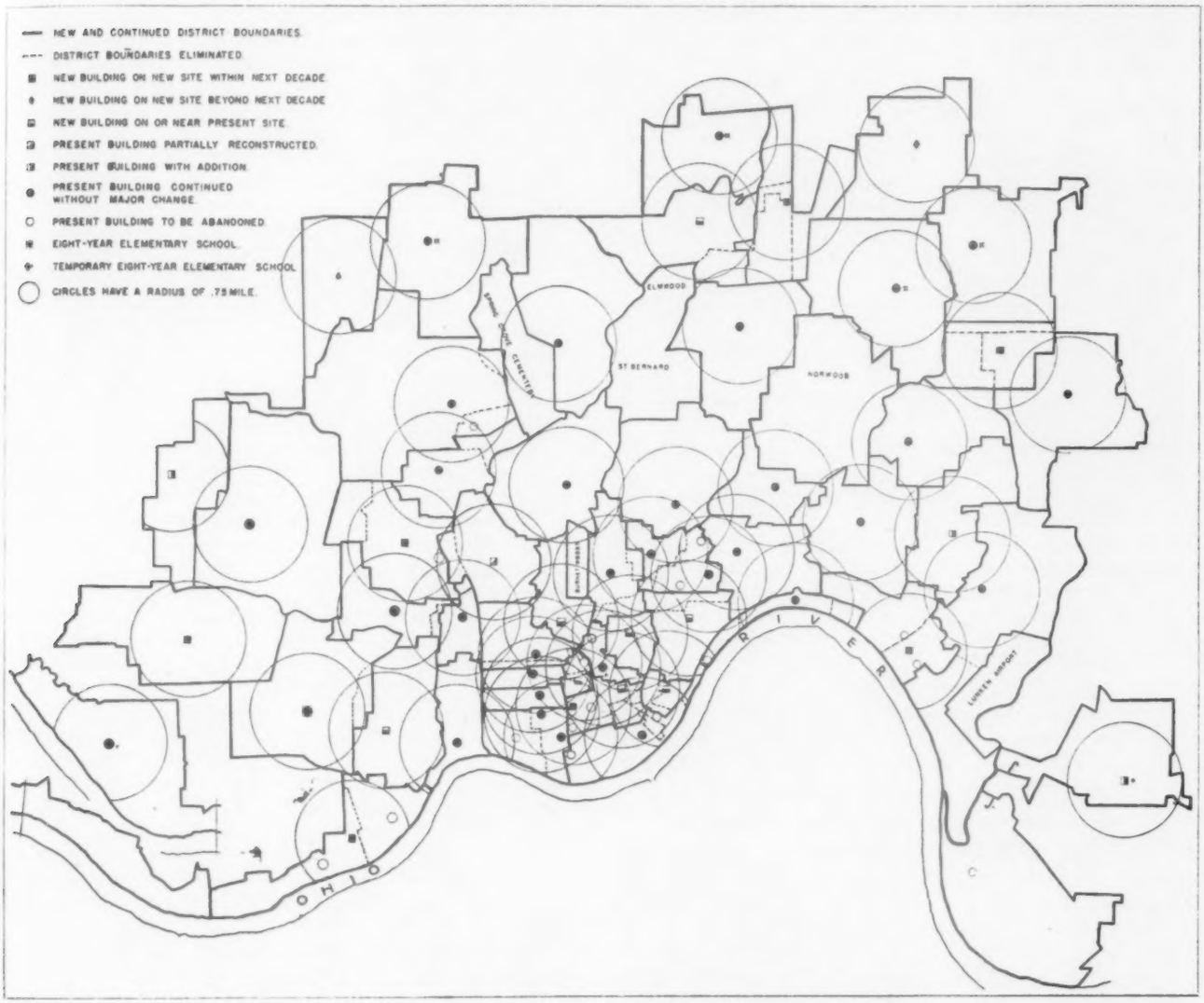
Factors Studied and Findings

This survey included a careful study of the general characteristics and growth of the Cincinnati school district. Population trends were considered. It was found that the ratio of young people to old is steadily decreasing and is lower in Cincinnati than in other large cities of Ohio. Evidence did not indicate any great increase in population in the future—a finding which has, of course, important implications in planning school buildings.

National and local trends in school organization were studied. As early as 1915 Cincinnati had moved toward the 6-3-3 plan of organization, but due to a lack of funds for building improvements, few junior high schools were established. After careful consid-



Population changes for the 107 census tracts in Cincinnati, from 1900 to 1940 (from published report of survey)



Recommended elementary school buildings and districts (from published report of survey)

eration of the different types of organization—the kindergarten-8-4, the kindergarten-6-6, the kindergarten-7-5, and the kindergarten-6-3-3—the recommendation was that Cincinnati move toward more complete realization of the kindergarten-6-3-3 plan.

In considering conditions in existing school plants, it was noted that of the 81 school buildings in use in 1942-43, 7 were more than seventy years old; 11 more than sixty years old; and 25 had been built more than fifty years before. The cost of buildings in use was estimated at $30,000,000.

Another phase of the study had to do with the degree to which existing buildings are used. In general, it was concluded that elementary schools were somewhat overcrowded but that secondary schools were efficiently utilized.

Recommendations for Building

The survey recommended a building program which included:

Thirty-one new buildings at an estimated cost of $15,980,000;

Twenty-nine new sites at an estimated cost of $3,509,000;

Nine building additions at an estimated cost of $850,000;

Seven major building alterations at an estimated cost of $200,000;

The enlargement of fourteen sites at an estimated cost of $1,012,000.

The total cost of the school building program was estimated at $21,551,000. Of this amount, $20,131,000 was suggested for needs of the next ten years. These estimates were based on prices current in the spring of 1944.

Principles Underlying Recommendations

Recommendations for future building were based upon the following principles:

1. The junior high school plan should be established wherever feasible, and, insofar as possible, junior high schools should be housed in separate buildings apart from older and younger pupils.

2. Special schools should include a college prepara-

tory high school, vocational high schools, a special adjustment school for adolescents, and a school for crippled children.

3. The present policy in regard to separate schools for Negro children should be continued (on an optional basis), but new buildings should be so located as to permit abandonment of this policy.

4. Existing buildings continued in service should be used for the purposes for which designed and best adapted.

5. Buildings scoring less than 500 points, in a rating survey based on 1000 for the so-called perfect building (Holy-Arnold score card), should be abandoned or converted.

6. Use of portable, frame, and rented buildings should be discontinued.

7. There should be a minimum of unused space in existing buildings.

8. Elementary building capacities should be based on 35 pupils per regular classroom; and high school building capacities should be based on 70 per cent pupil-station utilization.

9. Schools of fewer than 500 pupils should be avoided wherever possible.

10. Transportation, rather than separate buildings, should be provided for isolated groups of children. Buildings should be strategically located to serve the entire city.

11. No new buildings should be placed near the boundaries of the district without consideration of the location of school buildings in adjoining school districts which might be brought into the Cincinnati school district by future annexation.

Bond Issues Carry by Large Majorities

Although the survey was not finished until January 1945, preliminary building estimates were made, and the issue submitted to the public in the November 1944 election. The board of education acted in cooperation with the city and county officials, and the bond issues submitted were $16,000,000 for the schools, $9,000,000 for the county, and $16,000,000 for the city. All issues carried by large majorities, the school issue receiving the approval of 83 per cent of the voters.

The campaign for these bond issues was handled by a citizens' committee. The committee's success in presenting the issues to the public is the more striking because of failures of preceding bond drives. Eight times between 1933 and 1941 the Cincinnati board of education submitted school building issues unsuccessfully.

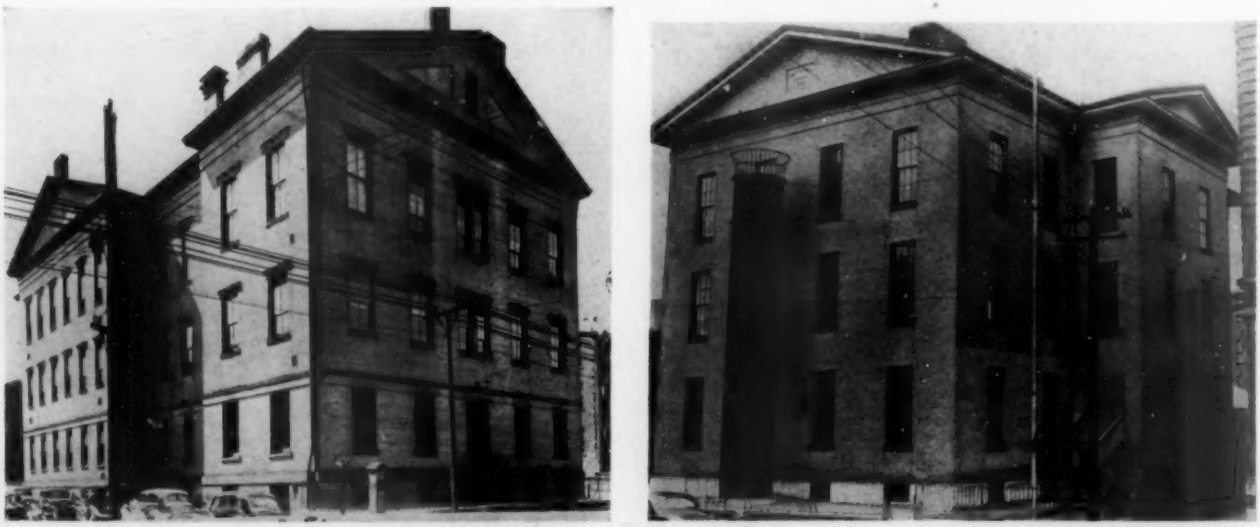
Education and Participation of the Public

The final survey report was given to the board of education January 22, 1945. At this point, the community was thoroughly acquainted with the issues involved in the survey recommendations. Immediately after the report was received, the superintendent of schools—acting at the direction of the board of education—sent a press release to newspapers in the section. The three daily Cincinnati papers, and many suburban newspapers, assisted by publishing the survey recommendations in considerable detail.

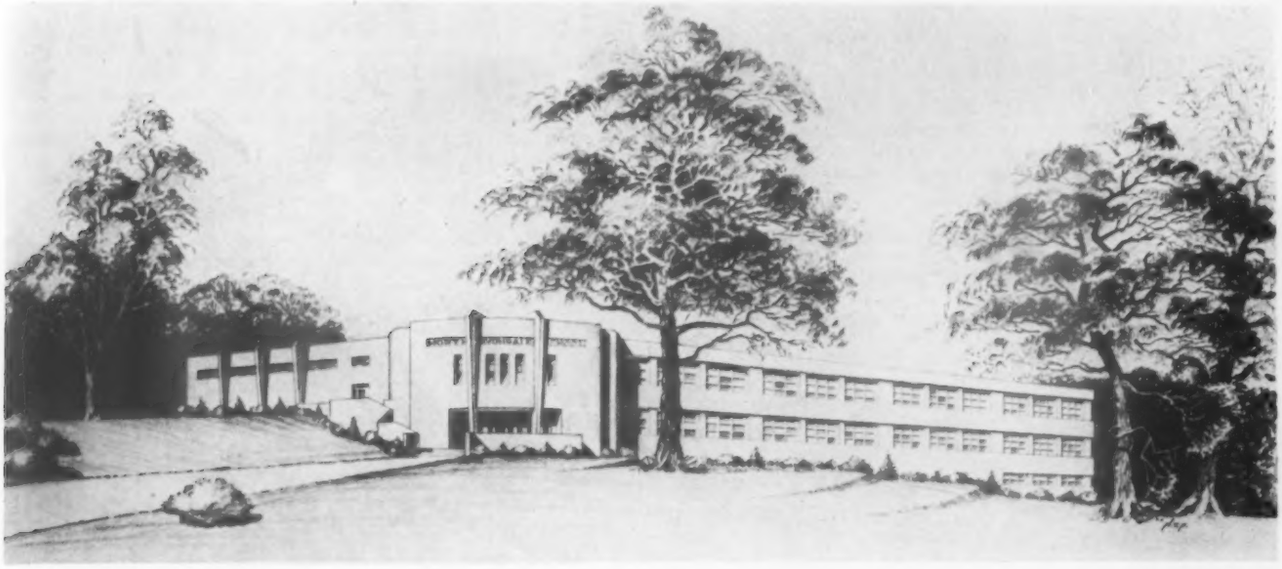
The superintendent immediately gave copies of the complete report to each school principal who was asked to promote community study of the report. An eleven-page summary of the report was mailed to 550 civic leaders; later, 50 more copies were distributed on request. One hundred copies of the complete report were made available on a loan basis, and this fact was announced at every opportunity.

Arrangements were made for the explanation of the survey recommendations to various community groups. Speakers were provided for 26 community meetings. In each case, the plan of presentation was the same: the speaker discussed the recommendations of the survey report, and a general discussion period followed. Records were made of these discussions, and the records were carefully studied later by the board of education meeting as a committee of the whole.

Many of these discussions among community groups were of several hours' duration. After the discussion, if the group or any interested person was not yet sat-



Old school buildings which are to be abandoned. The one on the left dates from 1858



E. C. & G. T. Landberg, architects

Sketch of North Avondale School, one of the buildings to replace antiquated structures such as are shown on the page facing

isfied about a part of the report, a hearing before the board of education was offered. Thirteen delegations requested and received this privilege. Also, during the period in which the survey was under discussion, the board of education received letters from various groups of citizens.

Final action on the report was not taken until five months after it was received. During this period, the board of education met weekly in committee and considered carefully the questions and criticisms raised in the community meetings, the board hearings, and the communications received. Of course, not all suggestions were complied with, but some changes were made as a result of criticisms from interested groups of citizens.

Report of Progress

The recommendations of the survey committee were adopted in a final action of the board of education on June 25, 1945. Since that time, substantial progress has been made in carrying out the ten-year program. The board has provided for a Site Selection Agency and a Schoolhouse Planning Committee. The Site Selection Agency has set up detailed criteria, approved by the board, which will make the problem of site selection as objective as possible. To assist the Schoolhouse Planning Committee, outstanding consultants both in educational planning and in building design and construction have been called in.

Staff Participation in the Planning

The school staff was encouraged also to participate in the planning. Two types of committees were set up. Twenty-seven "special" committees were appointed to make recommendations concerning a particular room or department, such as the kindergarten rooms or the janitorial department. These special committees were made up of teachers, principals, supervisors, janitors, engineers, lunchroom workers, and city health authorities. Each committee met at least once during the spring of 1945 to discuss problems of planning. Later, these committees will make suggestions on equipment.

There were also six "general" committees, made up of administrative personnel. Each dealt with a particular type of school, such as the elementary or the junior high school. These committees reviewed and correlated the work of the special committees.

A manual for the guidance of architects was prepared on the basis of the work of these committees, the experience of the maintenance staff, and the advice of numerous consultants.

Architects' Manual

The architects' manual is something unique in school planning. Prepared for the guidance of the various architects who will plan the 31 new buildings and the numerous alterations and additions, the manual tries to anticipate and answer questions that the architects will need to ask. The foreword of the manual sets forward the purpose and spirit of the manual.

> Acceptance by the architect of the contents of this manual as dogmatic and final will defeat its purpose. Each architect has been selected as a competent, professional expert, who can and will criticize the suggestions in this manual in the light of his expert knowledge. The owner will not only expect such critical appraisal, but will also expect the architect to accept full responsibility for whatever he finally recommends, unless the owner imposes clearly mandatory requirements.
>
> This manual and whatever supplementary materials may be prepared are simply devices to promote a meeting of minds, and as such will need to be improved from time to time in the light of architects' questions and criticisms. Frank comment by architects is sincerely solicited to the end that cooperative planning may be most effective.

The manual includes, besides general procedure, chapters on Development of Site, Design of Gross Structure, Interior Rooms and Spaces, and Mechanical Systems. A few lines from the last named chapter

will serve to illustrate the extent to which the planning committees have tried to specify needs.

6. Alarms and Signaling Devices
   a. Fire alarms
      (1) Use manual type only in small schools; in others, install both electric and manual.
      (2) Use Klaxon type signals.
      (3) Use extra loud audible signals and visual signals in shops.
   b. Class bells
      (1) Consider use of tubular gongs in classroom areas.
      (2) Use bells in noisy places.
   c. Buzzers, etc.
      (1) Install call bell button at main entrance, and perhaps some auxiliary entrances, and connect the buzzer in office and bells in custodian's office and boiler room. Install cut-out switch.
      (2) Design administrative offices for easy installation of any necessary inter-office buzzer lines.

From the chapter on Design of Gross Structure, here are a few lines from item three, Flexibility of Interior:

A. Design building that is highly flexible as to interior arrangement and use, in order to permit adaptation to future changes in educational program.
B. Suggested devices for achieving flexibility:
   (1) Use as few weight-bearing partitions as possible.
   (2) Keep wires, ducts, pipes, etc. out of transverse partitions and other partitions likely to be changed.
   (3) Fit as many rooms as possible into a standard modular unit of room length. Room sizes proposed in Chapter IV are in terms of length units of 12'6" for elementary schools and 10'0" for secondary schools. Widths of 23' in the clear are contemplated for most rooms.
   (4) Arrange classrooms in unbroken rows of 3 or more each. One or two isolated rooms are difficult to rearrange.
   (5) Provide spaces for later installation of pipes, ducts, etc. as needed to change length of rooms, or to install new plumbing, wiring, or other facilities in any unit.
   (6) Place some standard classroom under, over, or adjacent to each laboratory or special classroom center, so that additional or enlarged special classrooms can be provided with minimum of cost for changes in plumbing, etc.

The report on school building needs in Cincinnati has been printed by the Bureau of Educational Research of the Ohio State University. Paper-bound copies of it cost $1.50 and can be secured from the bureau.

The way in which this report was handled, the way in which the community was acquainted with it, is outstanding. The public and the press have reacted favorably to the program. Much has been said about "taking the problems to the people." Here is an example of what can be done when the community and the school personnel are brought into the planning of an extensive schoolhouse building program.

DEVELOPMENT OF STATE RESPONSIBILITY FOR SCHOOL AND COLLEGE BUILDINGS

By ARVID J. BURKE

Director of Studies, New York State Teachers Association, Albany

AFTER the Revolution, the first concern of the states was the reestablishment of higher education. The early constitutional and legislative provisions were very general. The distinction between public and private institutions was not clearly defined. Academies and colleges were not easily distinguishable. Many of the academies later developed into colleges and universities.

State Financial Responsibility Came Early

Academies and Colleges

During the half century following 1776 most states made specific appropriations for academy and college buildings or provided land grants, endowments, and appropriations which could be used for buildings or provided loans and lotteries for buildings. Lotteries are omitted here, because they do not represent aid from the state itself.

General and special legislation giving state aid for academy and college buildings can be found as early as 1784. That year Georgia inaugurated the policy of granting aid to academies to erect buildings; it also provided its first appropriation for buildings for the University of Georgia.[1] In 1786 Massachusetts had been providing funds for buildings at Harvard. In 1790 North Carolina made grants to the University of North Carolina for buildings and in 1791 provided loans for buildings. In 1796 New York State made a grant to Union College for buildings. In 1801 South Carolina appropriated $50,000 for the erection of buildings for its state college. In 1809 New Hampshire provided aid for a building at Dartmouth.

Practically all of the older states except Delaware and Rhode Island made appropriations or created endowments for academies and colleges which were not earmarked for specific purposes between 1776 and 1820. In 1779 Pennsylvania gave the University of Pennsylvania a land grant and an annual appropriation. In 1781 it provided land grants for academies. Maryland in 1782 began supporting Washington College. By 1784 New York State was making grants to Columbia College and to its academies, and Virginia was giving aid to William and Mary and Hampden Sidney Colleges. In 1785 Georgia was providing support for four colleges. Massachusetts in 1791 began endowing academies with land. Yale was receiving grants from Connecticut in 1792. The next year New Hampshire provided general aid for academies. Vermont in 1794 provided land grants for academies. In 1796 Princeton began receiving appropriations from New Jersey. Academies began receiving land grants in Kentucky in 1798. Tennessee began to follow this policy after 1806.

The issue of control was emerging before 1820. For three years Columbia College was a state institution controlled by the State Board of Regents (1784-1787). Attempts were made to extend state control over Harvard, the University of Pennsylvania, and William and Mary and Dartmouth Colleges. The Dartmouth College Case (1819) marked the beginning of decreased state aid for private institutions and the rise of institutions under state control. Some state institutions already had been established. The University of North Carolina opened in 1795; University of Georgia (1801); University of South Carolina (1805); Ohio University (1809); and the University of Tennessee (1820). The University of Virginia was established in 1818 although it did not open until later. The University of Indiana and University of Alabama both were founded in 1820, but they did not open until later. The University of Vermont, a quasi-public institution, had its beginnings in 1791, but it did not become a state institution until later, and the University of Michigan received its impetus from a university created in 1817, but it did not become a state institution until later.

Elementary Schools

State responsibility for elementary education was recognized at an early date in many states, but nothing much was done in most states to assume this responsibility prior to 1820. The constitutions of North Carolina and Pennsylvania, adopted in 1776, required the establishment and support of elementary schools. The Georgia and Vermont constitutions of 1777 contained similar provisions. The constitutions of Massachusetts (1780), New Hampshire (1784), and Delaware (1792) required the states to encourage learning. Ohio (1802), Indiana (1816), Mississippi (1817), Alabama (1819), and Maine (1820) provided for the establishment of schools or the encouraging of learning. Other state constitutional provisions for the establishment and support of schools came later.

Connecticut established its school fund in 1750, and Delaware created its fund in 1796, but prior to 1800 New York, Connecticut, and Vermont probably were the only states providing aid for elementary schools. In 1782 Vermont and New York provided aid for elementary schools. Connecticut (1789) apportioned aid according to population and wealth. In 1795 New York provided the first money grant. This grant was apportioned on the basis of the number of taxable inhabitants, and its use for the erection of school buildings apparently was not prohibited. In 1799 it

[1] Footnotes have been omitted. Data for this paper have been taken from so many different sources that footnotes would take as much space as the text itself.

levied the first state tax for elementary school support, but it was not renewed. In 1811 South Carolina provided $300 per school for current expenses, but buildings had to be provided by local effort. New York in 1812 put its elementary schools on a firm foundation by providing for a state superintendent, a system of school government, state aid, and a compulsory local tax. Aid was limited to teachers' salaries. School buildings had to be erected at local expense.

The states prior to 1820 generally tried to fulfill their responsibility for elementary education largely by encouraging local tax support for schools and school buildings. New Hampshire in 1783 authorized local taxation for schools and made it compulsory in 1789. Vermont authorized taxation in 1782 and 1794, making the tax compulsory in 1810, and New York followed in 1795, making the local tax compulsory in 1812. Connecticut permitted local taxation for school buildings in 1794; in 1799 a compulsory tax was passed for school support. After the Revolution, Connecticut continued the policy of requiring a six months' elementary school, and Massachusetts (which included Maine until 1820) followed a similar plan after 1789. These provisions made some kind of local support mandatory. The Maine Constitution of 1820 required local support for schools.

A number of permanent school funds were created up to 1820 with which the states apparently hoped eventually to meet their responsibilities for elementary school support. New York established its first permanent common school fund in 1805. This was followed by Tennessee (1806), Virginia (1810), Maryland (1812), New Jersey (1816), Georgia (1817), and South Carolina (1811). These funds later helped to establish elementary schools.

The development of systems of state elementary schools in the West also was encouraged by the ordinance for governing the western territories adopted by Congress in 1787. When Ohio was admitted to the Union in 1802 it was given a section of every township for maintenance of schools. This policy was extended to other states admitted after that time.

Public elementary schools were slow to develop during this period because (1) churches sought to retain control over education (2) the need for universal schooling was not yet fully recognized, (3) taxpayers were unwilling to pay for the education of others' children, (4) the states were weakened economically by the war, and (5) the states used their meager resources to reopen academies and colleges before aiding elementary schools.

During 19th Century, Responsibility Changes

Aid to Private Institutions Declines

The Dartmouth College Case (1819), the rise of Jacksonian democracy (after 1820) with its antipathy toward European aristocracy entrenched in private colleges, and the desire for separation of church and state (especially after 1818) marked the decline in state grants for buildings and general support for private colleges. Connecticut's grants to Yale ceased after 1831, but it continued grants to other colleges until 1855. After Massachusetts severed its state connection with Harvard in 1865, it continued grants to other colleges until 1870 and to academies until 1871. It did not break its state connection with Amherst until 1872. Two private technical institutes were aided until 1916.

Connecticut at first turned over its federal land grants under the Morrill Act (1862) to the Sheffield School of Yale, but in 1881 it opened its own state college. New Hampshire made Dartmouth its land grant college, but in 1903 it created the University of New Hampshire. Oregon made a private college its land grant college but made the institution a state college in 1885. Rhode Island made Brown its recipient of the federal land grant but in 1888 opened its own state college. New Jersey and New York are the only two states with federal land grant colleges under private control. Of course, the University of Vermont, a state university, is relatively free from state control. By 1900 only six states were providing any substantial aid for private colleges: Maryland, Massachusetts, New Jersey, New York, Ohio, and Pennsylvania.

Ascendancy of State Institutions

With the exception of New Jersey and New York all of the states admitted to the union by 1900 had assumed responsibility for the erection of buildings for state colleges and universities (even in these two states the state had appropriated money for state normal school buildings). Although many of the state institutions had been founded prior to 1850, state tax support generally did not come until later. Aid for buildings generally preceded support for current expenses. Support did not come without opposition. The right of the state to tax for the erection of buildings for normal schools, colleges, and universities was tested in the courts many times between 1850 and 1900.

Appropriations for buildings soon followed the establishment of state colleges and universities. Massachusetts State College had its beginnings in 1856. It received grants for buildings in 1867. Rhode Island State College was established in 1888; building aid was provided in 1899. Virginia created its state university in 1818 and provided money for buildings in 1823. The state college of Maine was founded in 1865; in 1869 it received grants for buildings. Louisiana established Tulane University in 1847 and appropriated money for buildings in 1853. Ohio State University was founded in 1865; in 1885 it was granted funds for buildings. The University of Illinois was organized in 1867; building aid came in 1871. The University of Michigan became a state institution in 1835; in 1838 the state made a loan for buildings. The University of Missouri was founded in 1839; in 1866 it received state funds for buildings. The University of Iowa was opened in 1855; building support followed in 1858. The University of Colorado became a state institution in 1876; in 1877 it received tax support for buildings. The University of California was established in 1868; and in 1872 a building fund was created.

Regular state support for both buildings and current expenses in state institutions of higher education was stimulated by the Morrill Act of 1862. In many instances general support came years after the founding of the institution. The University of North

Carolina was opened in 1795 and became a state institution in 1821, but it did not receive regular state support until 1881. Ohio University opened in 1808; but state support did not come until 1881. The University of Vermont as a state institution dates from 1838, but it did not receive regular state support until 1886. The University of Alabama was founded in 1820; state support came in 1860. The University of Indiana also had its beginnings in 1820, but the state did not begin to support it regularly until 1867. The University of Michigan was incorporated into the state school system in 1835; it did not get regular state support until 1871. The University of Missouri was founded in 1839, but regular state support did not come until 1875. The University of Wisconsin as a state university dates from 1848; but regular state support goes back only to 1876. The first appropriation for the University of Minnesota was not made until 1867, and the regular state support did not start until 1888, but the institution was created prior to 1860.

Photo by Fairchild Aerial Surveys, Inc.



University of Vermont campus. Regular state support dates from 1886, although the university has been a state institution since 1838. The University of Vermont is relatively free from state control

State School Systems

During the nineteenth century state responsibility for schools became definitive and established. A system of public elementary and secondary schools under civil control with a compulsory tax became almost universal. State taxation for both elementary and high schools became an established policy in most states. State school officers with a beginning toward state education departments became a general practice. Compulsory education and state minimum standards were finding their way into legislation and regulations governing the apportionment of state aid. State financial assistance to private and denominational schools almost disappeared. The basis for state control over public school buildings had been established by 1900.

Specific illustrations of state requirements regarding buildings or state financial assistance for public school buildings are hard to find prior to 1875. Nevertheless, there is evidence of state leadership in improving school buildings and the development of standards for buildings prior to 1900. In 1821 Alabama created a Literary Fund for the education of the poor and the erection of school buildings. In 1825 Ohio permitted school districts to erect school buildings. In 1827 Vermont required towns to erect school buildings but provided no aid. Horace Mann, as secretary of the Massachusetts Board, after 1838 required reports on school buildings from all town school committees. He published model plans for schoolhouses with directions for construction, heating, and ventilation in *The Common School Journal*. He also prepared a manual on schoolhouse construction (1838). North Carolina in 1839 recommended five-acre sites for all schools. In 1840 Henry Barnard, then secretary of the Connecticut State Board, prepared his first treatise on school building construction. In 1846 New York State could withhold aid from districts which failed to provide a suitable schoolroom.

The chief responsibility for advising school authorities regarding schoolhouse construction or the approval of plans was generally delegated to town or county commissioners or superintendents of schools. The New York State common school law of 1812 required trustees to confer with town school commissioners relative to propriety of erecting school buildings. By 1880 this power had been conferred upon town, district, or county supervisory officials in most states. The 1846 school legislation of Virginia required the trustees "to select and purchase a site and build a good and sufficient school house thereon . . . as may be approved by the board of commissioners."

State superintendents who followed Mann and Barnard were concerned with school buildings as

evidenced by their annual reports; but their duties, however, generally were limited to making suggestions or recommendations. The State Superintendent of Vermont reported in 1846,

"Our schoolhouses are almost uniformly located in an uninteresting and unsuitable spot"
"a large part of these buildings throughout the state must be set down as in a miserable condition"

He recommended,

"a comfortable location, a sufficient yard and playground, a woodhouse and other out buildings, a convenient access to water, and the surrounding of the premises with shade trees"

Regarding school architecture he remarked,

"that low walls might be instanced as one of the prevailing defects in schoolhouse architecture."

However, as the practice of accrediting schools became established, state education departments began to establish minimum standards for buildings. Beginning in 1873, Indiana began accrediting high schools,[2] a practice which rapidly spread to other states. Wisconsin (1871) and Minnesota (1887) provided state loans for school buildings. New York State (1887) authorized the state superintendent to procure plans and specifications for buildings and distribute them to school districts planning to erect buildings. State Superintendent Skinner of New York State published a manual on "Recent School Architecture" in 1897.

The policy of providing general per capita aid not earmarked for current expenses or teachers' salaries continued in many states. Even where aid was so earmarked there is evidence that it was sometimes used for capital outlays. Connecticut in 1821 repealed the mandatory two-mill town tax for schools and did not restore it until 1854. Local school taxes practically disappeared, and for a short period the state paid all school expenses in many districts. However, as expenditures increased, the income from the state fund failed to keep pace, and rate bills became common; so the system failed. Between 1837 and 1861 school districts in Delaware had to raise only $25 in taxes to get state aid. No doubt it was possible for many school districts to finance part of their capital outlays from state funds. The 1849 law in Minnesota left the support of buildings to local effort, but some localities used part of the funds for buildings. Between 1855 and 1901 Alabama provided no aid for buildings but allowed no local taxation for schools; so some of the state aid must have been used for capital outlays.

The policy of earmarking certain state aids for current expenses or teachers' salaries which was adopted in many states did not always represent a denial of state financial responsibility for school buildings. State funds were not sufficient to meet all expenses for schools. States were forced to use their limited financial aids to solve the most pressing problems at the time. One of the first concerns of the states was the securing of better qualified teachers. So many states, e.g., New York in 1812, earmarked all or part of state aid for salaries. After 1850 states became concerned with inequalities in local taxpaying ability. New York (1851), Massachusetts (1874), and New Jersey (1881) adopted apportionment plans designed to aid weak districts in securing qualified teachers without excessive rates of taxation. With the growth of state supervision over schools, states found it necessary to promote certain essential public school services such as high schools, libraries, supervision, and special teachers, and a number of special aids earmarked for particular purposes were incorporated into state laws.

[2] The University of Michigan had started accrediting high schools in 1871 or 1872, which was an indirect type of state control.

School Building Control, a 20th Century Development

Establishing State Control

The twentieth century inaugurated state responsibility for the enforcement of state minimum standards for school buildings, requiring approval of plans and specifications and other kinds of state supervision. New York State passed its first law governing school building construction in 1902. In 1903 it provided a full-time inspector of school buildings. The next year it strengthened its power by requiring certain definite standards for school buildings, requiring state approval of plans and specifications, and creating a bureau of school buildings and grounds. By 1916 the bureau had become a division in the State Education Department.

Other states had been taking similar steps. As early as 1910 thirteen state departments of education and nine state boards of health were exercising some control over school buildings. Indiana (1911) adopted its Sanitary Schoolhouse Law. Ohio (1911-1913) adopted a school building code. Minnesota in 1913 organized a school buildings division in its state department to administer the state laws regarding school buildings.

Growth of Control

State control over school buildings spread rapidly after 1910. Twenty-four states had no regulations on school building planning or construction in 1910. By 1915, only thirteen had no regulations; in 1920, only four had none. By 1915, twenty state education departments and ten state boards of health were exercising a certain degree of control. The number increased to thirty-six and twenty-one respectively by 1920. By 1930, almost all states had laws or regulations relative to school buildings; twenty required approval of plans by state agencies; fifteen had power to condemn buildings; and twenty-three had power to approve. In 1931, nineteen states had bureaus or divisions of school buildings and grounds. This number had been increased to twenty-two by 1940. That year thirty-nine state departments reviewed plans and specifications for school buildings; twenty-five had legal provisions for enforcing these provisions.

The control of the states over school plants increased within individual states. In 1915, six had regulations regarding sites and only four had provisions regarding grounds; in 1940, thirty-one states were exercising such controls. In 1910, only four had regulations on construction; by 1940, only four had no such regulations (three states did not provide data). Fourteen states (1940) supervised the construction of school buildings, and thirty-three inspected school buildings.

Financial Responsibility for Buildings Revived

Colleges and Universities

The responsibility of the state to provide buildings for state educational institutions was well established during the nineteenth century. The developments during the past forty-five years merely represent extensions of policies well established in the nineteenth century: (1) aid to private colleges continued to decrease, New Jersey, New York, and Pennsylvania being the only states to provide any substantial aid for private colleges and universities, (2) the number of building funds for colleges and universities increased, (3) provisions were made for financing capital outlays through special appropriations or state capital improvement budgets, and (4) provisions for planning future capital outlays by state planning boards or commissions.



Rhinebeck Central School to be erected in historic Dutchess Co., N. Y. (Moore and Hutchins and E. D. Stone, architects). The state is sharing cost of planning and construction

Elementary and Secondary Schools

The assumption of state control over public school buildings and the establishment of state minimum standards forced some states to make provisions for buildings, capital outlays, and debt service, particularly in districts with insufficient taxable property to provide buildings that met state minimum standards without excessive local taxation. About 1901 Alabama first provided aid for rural buildings. Delaware (1903) made an annual appropriation for the erection of school buildings in Negro districts. North Carolina (1901) required counties to set aside a portion of their funds for buildings in order to get state aid. Two years later it created a revolving fund for making loans for rural buildings. Virginia began providing loans for school buildings in 1906. Louisiana (1904) adopted a constitutional amendment permitting the legislature to issue $1,000,000 in bonds to erect school buildings in communities not able to provide them with their own resources.

It was soon learned that the soundest method of providing satisfactory housing for pupils in financially weak districts was through consolidation of districts. Maine (1909) and New Hampshire about the same time assumed complete state control of schools and their financing in sparsely settled areas. Aid for buildings in consolidated districts was first provided in Minnesota (1911), Missouri (1913), Oklahoma (1913), Wisconsin, Iowa, Rhode Island and South Carolina (all prior to 1915), Alabama (1916), Delaware (1919), Maine (1921), Pennsylvania (1921), New York (1925), Arkansas (1927), and Vermont (1933). Wisconsin and Minnesota have repealed their provisions.

The earliest provisions for aiding consolidated district buildings generally have provided for the state paying a percentage of the costs up to specified maxima. Minnesota (1911) paid one fourth the cost not to exceed $1500. In 1921 it paid 40 per cent of the cost not to exceed $6,000. South Carolina (prior to 1915) was matching each $100 raised locally up to one fourth the cost. Wisconsin (prior to 1915) paid one half the cost up to certain maxima ($500 for a one-room building and $5,000 for a high school). Delaware (1919) paid 20 per cent of the first cost not to exceed $10,000. Missouri (1923) paid one fourth the cost up to $2,000. Oklahoma (1913) paid one half the cost not to exceed $2,500. New York (1925) paid one fourth the approved cost. Vermont (1933) provided its grants on a matching basis.

Another plan that emerged was paying so much for

each small school closed or so much for each new building erected. Rhode Island (prior to 1915) gave $100 for each school closed. Iowa (1915) provided grants of $200 to $500 for equipment and in 1931 provided $250 to $500 for buildings and raised this to $200 to $750 (1940) with an allowance of six dollars per pupil for schools meeting certain standards. Maine (1921) made grants of not more than $500 a year for each consolidation. Pennsylvania (1921) provided $200 for each school closed. South Carolina (1931) allowed $400 to $1,000 for each building. Missouri (1931) gave $1,000 for each building closed.

Delaware became the first state to assume almost complete responsibility for school buildings and their financing. The legislation adopted in 1927 required a two per cent local contribution based upon the assessments of 1919, but for many years the state paid the amounts coming due on the principal. From 1919 to 1940 more than $21,000,000 was spent on school buildings. The state paid 58.8 per cent of this amount; federal grants account for 6.9 per cent; gifts, 20.7 per cent; the local contribution, 2.8 per cent; and bonds outstanding 10.8 per cent.

New York State (1941) applied the equalization principle to building aid for central districts. Central districts are allowed $450 a pupil for buildings adjusted upward or downward according to changes in the costs of labor and materials since October 1, 1940. The state's share of the cost is determined by subtracting an amount equal to six per cent of the full valuation of the district. The $450 allowance does not include site purchase or improvement or equipment. The minimum allowance should have been $600 a pupil. The local contribution should have been reduced to four per cent or an annual levy for debt service not in excess of two mills on full valuation.

Other states have been moving toward complete state responsibility by including allowances for capital outlays and debt service in equalization programs. Arkansas (1927-1935) included debt service in calculating equalization allowances and permitted capital outlays to be included where needed. Alabama created its equalization fund (1927-1935) and included capital outlay and debt service allowances for rural districts. In 1939 these provisions were extended to cities, and in 1945 a $12,000,000 fund was made available for capital outlays and debt service. The Ohio equalization law adopted between 1928 and 1931 allowed capital outlays to be included where there was an urgent need. The North Dakota equalization law passed in 1933 included allowances for capital outlays. The new equalization law in Florida (1945) makes an allowance for debt service. The new Connecticut law (1945), although not an equalization law in the strict sense, allows debt service in calculating state allowances.

Many states recently have taken specific measures to aid districts with buildings, capital outlays, or debt service. North Carolina created a special building fund which was increased from time to time to make loans for school buildings. The fund amounted to nearly two million dollars in 1939. Rhode Island (1923) permitted the State Board to use the income of the permanent fund for school buildings. Arkansas (1927) created a revolving fund for making loans for school buildings not to exceed $10,000 per building. In 1931 the fund amounted to $750,000, and in 1943 it reached a million. The same year (1927) Tennessee created a fund of $500,000 for rural school buildings. Minnesota, under its 1933 law for apportioning the revenues from the income tax, required that the funds be used first for liquidating indebtedness in all districts; and in 1936 it repealed its aid for consolidated district buildings. New Mexico (1933), Colorado (1937), and Oregon (1943) created state funds to be used to reduce local or county school taxes. These are indirect aids for debt service and capital outlays. About 1938 Pennsylvania authorized the State Council to use the income of the State School Fund for buildings, but this aid amounted to only $38,000 in 1942. The interest rates charged for loans under the Virginia fund ($12,000,000) were reduced to two per cent in 1944, with loans permitted for 85 per cent of the cost of buildings (it had been 75 per cent). Washington in 1941 created a $3,000,000 school building fund. Ohio (1945) made an annual appropriation of $1,000,000 for school buildings, to assist districts with less than $6,000 valuation per pupil (a 1943 law appropriated $1,000,000 for this purpose in districts with less than $4,800 a pupil in valuation). Until the amount of the appropriation is increased, the money will be used only for school plant rehabilitation. Connecticut (1945) created a $2,000,000 school building fund for remodeling, enlarging, or building, limited to grants of $50,000, or one third the actual cost, or $150 a pupil. Indiana (1945) created a postwar building project. The Illinois legislature appropriated $4,850,000 for planning postwar building projects (1945), earmarking $625,000 for school districts to defray half the cost of preparing plans and making studies.

Some states also provide aid which is not earmarked for current expenses or teachers' salaries. New York State equalization aid is calculated upon the basis of current expenses, but the school districts may use it for all school expenses providing they raise a tax of five mills on full valuation. State aid in Massachusetts goes into the general treasury of cities and towns and may be used as they see fit. Among the states that place no legal restrictions upon the use of all or part of their state aid are Louisiana, Wisconsin, South Dakota, Idaho, Washington, Utah, Arizona, California, and Oregon.

During the past century and a half almost all states have assumed responsibility for public school buildings through various state controls. Financial responsibility occasionally preceded control but usually followed control. The majority of states have assumed varying degrees of financial responsibility for erecting or remodeling school buildings or providing aid for capital outlays and debt service. The extent of control exercised by states would justify the state assuming almost complete financial responsibility for buildings as was done in Delaware. Certainly more states will be obligated to include capital outlay and debt service allowances under equalization for all satisfactory school districts. Special aids for buildings will have to be placed upon an equalization basis as has been done in New York and limited to satisfactory districts.

POSTWAR SCHOOL BUILDING COSTS

By SEYMOUR WILLIAMS

Architect; Inspector of School Plans and Buildings, Department of Education, State of New Jersey, Trenton

HOW much will it cost to build a school building immediately after the war and where will costs go in the postwar period is the "simple" problem placed before us for "profitable discussion." Maybe it is profitable for us to tackle a problem we know so little about, even if "it's anybody's guess" would be an understatement when so many known factors are undetermined at the same time as so many factors are unknown. We can't emulate Drew Pearson and say, "I predict," even if we were willing to go out on a limb. But if the cost of school building construction in the immediate future is anybody's guess, then I agree that we should do some of the guessing ourselves, because, without any foundation of fact, we are expected to know at least a little more about cost trends than our client—the public and the school board—and even the architects are asking us.

Techniques of Guessing Trends

Guessing can prove interesting, even though it may not prove profitable, for there are so many techniques of guessing. There is the easy technique of making a flat statement without any thought on the matter; if stated positively, it often gets by. There is the technique of following the newspapers. An avid reader can become so confused at the contradictory statements on factors controlling trends that he is ready to hazard any guess, and let it go at that; for the indications are that no one else knows the answers so why should he be expected to. There is also the technique of comfortable deliberation in front of your own fireplace with your pipe drawing well, and all statistical charts, graphs out of reach—the time when you think back over your own experience and conclude that the low spots, and the high spots in business, have resolved themselves into an average level, over the years, that have a definite tendency to go higher but never lower.

Then there is the hard-working technique of putting on your galoshes and going out in the rain to known sources of information; and when you have collected a wealth of material, you stay up late trying to decode the statistical data, so that you can add it all up and form some conclusion as to where costs are going in the postwar period. This is the most confusing technique I know, for "a little knowledge is a dangerous thing." The sanest technique is crystal gazing; you always have an out because you can bust the damn thing if you guess wrong. Therefore, I bought myself a new crystal ball for a dollar which gave me a hundred chances to one that I'd be right, and my prediction of trends to come is based on what I learned in my crystal gazing.

Comparison of End of War Costs

I don't think it was a very new ball at that, for it took me as far back as World War I and the intervening years up to World War, or Global War, II. I noted a cost index for labor and materials, in the New York area, that, starting in 1913 at 54, remained static through 1915 and then rose steadily to 92 in 1919. There was a high of 123 in 1920, which dropped back 22 points to 101 in 1921, and a low of 99 in 1922. Between 1920 and 1935 when the index was 104.7, there were up's and down's but never a return to the 99 index of 1922; with increasing highs in 1926, 1928, 1929 up to an index of 128. With some fluctuations, the index dropped to 104.7 in 1935, and then rose steadily, with never a setback, to 1944, when the index was 149.6. As of September, this year 1945, the index has risen to 157.1 for the New York area. The Atlanta area index is 123.6, and the St. Louis area 147.6. These figures are based on an average of 100 for the U.S.A. as a whole from 1926 to 1929.

The old glass tells us that costs at the end of World War II are almost twice what they were at the end of World War I. If they immediately jumped from 92 in 1919, to 123.3 in 1920, or an increase of 31.3 points following World War I, can we guess that the present index of 157.1 will increase to 180.9 before it drops back 22 points in 1946 to 158.9 and then advances approximately 15 points in the next five years?

Factor of Labor Shortages

At this point the crystal ball becomes clouded with factors affecting rises and falls that are unknown quantities yet should be known for us to hazard even a guess. One of these factors stands out, however, and since it is one of the two items of our index—labor—we should gaze at it to see what we can learn. We see that a comparison of population of some of the basic building trades indicates a definite bottleneck in the potential postwar building construction, due to a serious shortage in this population. There are statistics, for instance, which indicate that 93,000 brick and stone masons and tile setters were employed in 1940 when the dollar volume of construction in the United States was, in round figures, ten billion dollars. Estimates in 1944 of postwar construction indicate an average volume of sixteen billion dollars annually for a period of ten years. Statistical data gives the number of trained brick masons available as 65,000, with an indicated shortage of 82,500 for the estimated postwar work; the same statistics indicate that there were only about 1500 apprentices in 1940. What guess can we make on the effect this condition in the building trades will have on construction costs when the postwar building program gets under way?

Factor of Demand

Even a crystal gazer can see that a comparison of the period we are now entering with that following World War I finds the nation with a demand for new building construction so far in excess of that which

existed in 1918 that it would seem any comparison, of conditions, needs, and costs, could have little value in determining cost trends in our present and postwar period. However, assuming that the building industry was relatively subject to the same growing pains then as now, that the need and volume of work boosted prices then 31 points over the previous year, we might guess that even if the present growing pains are more painful, methods to allay them are more efficient. Therefore, it would make a good starting point in our guessing to assume the same increase for the present period would be relatively 40 points over 1943 and that consequently the cost index for 1946 would be 180. I have used 1943 index because there was considerably less fluctuation in the cost index of the War II period than in War I.

We don't have to guess about the cost index for construction as of September 1945 because we know that according to statistical data it is now 157.1 for the New York area. We can, therefore, apply data on old costs and check to some extent our assumed cost index of 180 in 1946.

Factor of Commodity Prices

But how valid can any conclusions be, at the very beginning of the anticipated postwar period, when such a tremendous volume of construction is anticipated on the basis of actual needs? Can we guess the answers when costs may be governed by the speed of the construction revival; by shift from controlled prices to prices determined in a free market accompanied by some confusion, whenever and however the change is brought about?

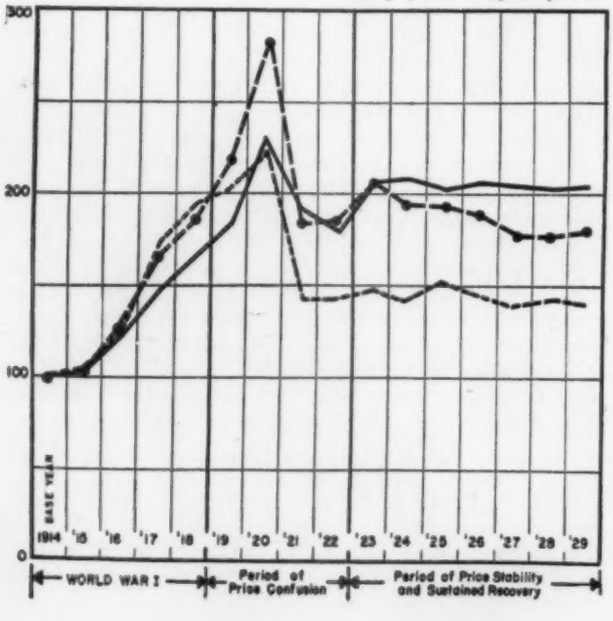
"When generally stable construction cost levels are reached after the period of confusion, the relationship of construction costs to levels of commodity prices and living costs may determine in great measure the volume of postwar construction," to quote from F. W. Dodge's *Blue Prints for V-Day*. If history repeats itself, can we guess that we are entering on a period of price confusion that may persist as in World War I through the greater part of four years and then become relatively stable for a period of two or three years to be followed by full recovery of construction activity, but leading to a great economic expansion over another period of four to five years? "Construction costs were stabilized on a higher level, relative to the prewar period, than were general commodity prices; in spite of this," still quoting from Dodge's *Blue Prints for V-Day*, "construction volume was larger than in any other peacetime period in the country's history. . . . During the seven years of price stability, . . . construction costs averaged nearly 105 per cent over 1914. A new price level was established, and a new relationship between construction costs and prices of commodities in general."

Factor of Price Control

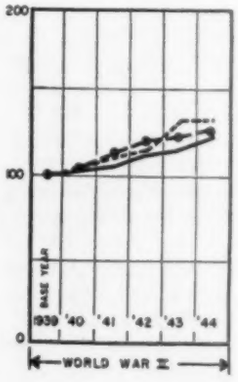
The similarities between the present situation and World War I might indicate the same cycle as just stated. However, the differences which are major factors, may reasonably alter conditions. These are —again quoting from Dodge—"price controls . . . much more effective this time. . . . Business executives and people generally are more keenly aware of the dangers of rapidly rising prices than they were twenty-five years ago. At various times in recent years they have exercised considerable self-restraint in the face of price inflation threats. The government will probably seek to avoid drastic deflation and widespread unemployment likely to result from it. Statistics on current price trends, current production and inventories will be more widely available and more widely understood than in the years 1919 and 1920."

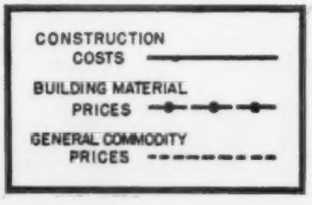
If as stated, price behavior will depend in a large part upon the behavior of the spending public, a slow return to volume building construction would tend to avoid running prices up very rapidly. Economists are not in full agreement on postwar price trends. Some anticipate price deflation. But, organized labor

Courtesy of F. W. Dodge Corporation



World War I was followed by a period of price confusion. Stabilization of prices after 1923, although at a higher level than in 1914, led to full recovery of construction activity and general business. New factors in picture this time create hopes for earlier leveling out of prices and relative lowering of costs





War and Postwar Price Trends

(Source: Survey of Current Business)

wants hourly wage rates advanced to retain their wartime take-home pay, and we seem to be on the threshold of similar demands all along those lines that affect building construction. However, it is believed that postwar inflation on the scale of 1919-20 seems quite unlikely and that greater emphasis will be put upon lowering construction costs than in the lush speculative period of the 'twenties.

A large part of the potential postwar construction market is in the field of moderate priced houses. Therefore, the postwar market will be rather sensitive to price rises and apt to shrink if construction costs appear very much out of line with general commodity prices and the cost of living. "Competition will create strong incentives to continued progress in cost-reduction methods, which will tend to offset price increases. It seems likely, however, that even with such improvements the postwar construction dollar will purchase somewhat less than either the 1939 or the 1944 construction dollar." That's my final quotation from *Blue Prints for V-Day*.

Are We Close to Maximum?

In terms of what will school buildings cost in the immediate postwar period, our guess is that, except for isolated cases, the old law of supply and demand will operate as a balance wheel. This natural law will assert itself in the construction field and prevent too great an expansion beyond present price trends. Furthermore, a comparison of the two construction cost curves of 1914 to 1918 and the present war period will give us some indication that we can anticipate more stability now than then. In World War I the curve ascended rapidly from a base of 100 to almost 250. In the present war this curve rose, relatively, from 100 to only 150. The period of price confusion from 1919 to 1922 receded finally to about 175 and then balanced off at an approximate level of 200 which became stable at that level.

From these two comparisons of the war periods it seems to me we can guess that there will be only a slight rise over the present index and little price confusion as compared with the aftermath of World War I and that we may even be approaching the maximum cost now in the estimated 40 per cent increase over the prices that have obtained in recent years. It is still anybody's guess, however, and that's my alibi for this attempted dissertation.

EDITOR'S NOTE: This paper was presented as an informal address at the annual meeting of the National Council on Schoolhouse Construction, October 1945, in Cincinnati, Ohio.

A STUDY OF RECENTLY ERECTED AND PROPOSED BUILDINGS OF TEACHERS COLLEGES IN THE UNITED STATES—1945*

By E. S. EVENDEN

Professor of Education, Teachers College, Columbia University

FOR the past several years, nearly all building on the campuses of the teachers colleges of the country has been stopped. Those responsible for the future of these institutions, however, have been making plans to meet the anticipated increased demands of the postwar period. Now that the war is ended, there is widespread interest in having plans advanced to a point that will permit the erection of needed new buildings as soon as labor and materials are available.

Committee Collects Data on Building Programs

When the standing committees of the American Association of Teachers Colleges met in Chicago late in February of 1945, it was apparent that a majority of the institutions represented there were hoping to start their building programs just as soon as possible after the cessation of hostilities. To the extent that these institutions were representative it became clear that the teachers colleges of the United States were on the verge of the most extensive program of building and remodeling in the history of these institutions.

When it is realized that these buildings in many cases will affect the educational programs of the colleges for periods of fifty or more years, it is obvious that every precaution must be taken to be sure that the new buildings are properly placed, efficiently planned, and economically and soundly constructed. Any college executive who has had any experience in adding college buildings to his plant knows only too well how important it is to plan carefully before contracts are let. He knows that he should consult frequently with the staff members who are going to use the building. He also appreciates the help that can often be obtained from visits to similar buildings in other colleges and from talking with staff and students who have used the buildings. Such visits frequently reveal mistakes or missed opportunities that have been revealed by use, as well as illustrate devices and special features that have proved to be desirable and to make for flexibility.

As it became plain that millions of dollars would be spent in these institutions in the next few years there was a general demand for more information about buildings that had been built in recent years and that would be "worthy of study" by persons planning to erect similar buildings. It was also felt that there might be advantages to knowing more definitely the extent of the building programs under consideration in this group of institutions. The Executive Committee, therefore, authorized such a study and requested the Committee on Standards and Surveys to make it and to get the results back to the presidents as quickly as possible. Accordingly, the data blanks were mailed out on March 7, and by April 7, when the tables were closed, 120 replies had been received. The immediacy of the problem seemed to justify sending the data on this number of returns rather than to take the time to wait for additional replies or send out a follow-up letter.

Much Prewar Construction Due to WPA and PWA

For convenience in listing buildings that presidents might want to visit the states were arbitrarily divided into four groups as follows:

Eastern: Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont

Southern: Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, Virginia, West Virginia

North Central: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, Wisconsin

Western: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming

It was felt that the total picture would best be presented by showing the buildings erected since 1930.

The data presented in Table 1 are adapted from the more detailed report submitted to the presidents. They show the amount of building that took place in fifteen years and the general areas of the country in which it was done. Incidental information obtained from the replies would indicate that a sizeable proportion of the building recorded in this table was made possible by WPA and PWA assistance. If this were so, the period would have been a lean one indeed without such aid since almost no building work took place after war was declared.

Since 120 member institutions returned the data sheets in time to be included in the tables and only 100 reported new buildings erected since 1930, it is apparent that about one-sixth of the teachers colleges of the United States did no building during the period 1930-1945 if the institutions which reported are typical of those which did not reply.

Data were returned by approximately two-thirds of the members. It can, therefore, be estimated that the 54 million dollars spent for new buildings during this

* Made for the Committee on Standards and Surveys of the American Association of Teachers Colleges and distributed in greater detail to members of the association from the Office of the Secretary, President Charles W. Hunt, State Teachers College, Oneonta, New York, May 1945.

period would be increased to 75 or 80 million if returns from all members of the association had been received. The table is arranged so that one interested in the amount of building in a section of the country or in a special type of building can obtain the desired information by some simple additional computations.

What Help Visits to Other Campuses Will Yield

In order to assist presidents who are facing the problems of postwar building to locate buildings of various kinds that would repay study by themselves or their architects or by committees of the faculty, each president was asked to indicate for his new buildings which, if any, he "considered 'worthy of study' by anyone interested in a building for the same purpose."

Seventy presidents responded to this request and listed in all 205 buildings which they thought were "worthy of study" by anyone interested in erecting a similar building. The list included representatives of almost every type of building, distributed geographically over most of the states. Thirty-eight buildings were reported from the eastern states, 68 from the southern, 77 from the north central, and 22 from the western. Personal acquaintance with many of the buildings listed as "worthy of study" by the presidents indicated that there was wide variation in the standards used in deciding whether or not a building should be so listed. It would be difficult to compile such a list and perhaps not even desirable. There is evidence in many states that reportedly good and modern buildings have been copied on other campuses without much, if any, adaptation to changed needs. In order to avoid this temptation, it is sometimes wise to see buildings that obviously should not be copied, but which may contain many helpful suggestions of things to do as well as some that should not be done.

If a president is interested in a new building, it is fairly certain that he cannot visit a similar building on another campus without getting a great deal of help. This help may well be of several kinds: (a) new "positive" ideas of facilities and arrangements that he and his committees had not thought of and which are obviously desirable; (b) "negative" ideas of things to be avoided because they had failed to justify their cost; or (c) suggestions for the improvement of phases of the building which had been considered, but which could be made better for the same money or provided for less money or efficiently combined with other parts of the building.

For the foregoing reasons the list of buildings reported as "worthy of study" is not presented here.

Buildings Going Up in Immediate Future

In order to get a better idea of the extent and importance of the postwar building programs for the teachers colleges in the United States, presidents were asked to report upon buildings that are now under consideration for future construction. The data re-

TABLE 1

DATA ON BUILDINGS ERECTED SINCE 1930, AS REPORTED BY PRESIDENTS OF 100 MEMPER INSTITUTIONS OF THE AMERICAN ASSOCIATION OF TEACHERS COLLEGES IN MARCH, 1945[1]

TYPE OF BUILDING	EASTERN		SOUTHERN		N. CENTRAL		WESTERN	
	No.	Total Cost[2]	No.	Total Cost[2]	No.	Total Cost[2]	No.	Total Cost[2]
I Administration Buildings	..	....	1	230	..	....	..	....
II Auditorium Buildings	7	1,643	1	75	2	344	..	....
III Classroom Buildings	5	1,652	5	725	4	1,161	2	342
IIIa Art Buildings	..	....	2	111	..	....	..	....
IIIb Education Buildings	1	100	..	....	..	....	..	....
IIIc Health Buildings	..	....	1	....	1	84	..	....
IIId Home Economics Buildings	..	....	..	....	..	....	1	40
IIIe Industrial Arts Buildings	3	415	3	164	4	300	..	....
IIIf Music Buildings	1	325	3	162	1	12	..	....
IIIg Physical Education Buildings	1	250	4	440	6	2,208	2	65
IIIh Science Buildings	1	150	8	1,275	4	774	..	....
IV Dormitories (men or women not indicated)	3	1,013	13	1,910	5	868	..	....
IVa Men's Dormitory Buildings	1	94	16	1,739	15	2,978	3	352
IVb Women's Dormitory Buildings	1	350	16	1,886	20	3,914	6	1,002
V Gymnasium Buildings	8	1,672	1	100	2	403	2	170
Va Men's Gymnasium Buildings	..	....	2	214	..	....	..	....
Vb Women's Gymnasium Buildings	..	....	1	132	..	....	..	....
VI Heating and Power Plants	3	355	6	535	3	461	3	275
VII Library Buildings	3	685	15	2,366	8	1,351	5	1,423
VIII Laboratory School Buildings	8	1,989	6	1,018	10	2,620	1	145
VIIIa Nursery School Building	1	50	..	....	..	....	..	....
VIIIb Elementary School Buildings	2	298	..	....	1	80	3	515
IX Student Center or Activity Buildings	..	....	6	536	6	1,046	2	197
X Stadiums	..	....	3	74	5	597	1	125
XI Swimming Pools	..	....	3	172	1	79	..	....
XII Total Plant	4	1,250	..	....	..	....	..	....
XIII Unspecified Function	1	100	2	88	4	1,058	..	....
XIV Miscellaneous Buildings[3]	7	519	29	1,142	11	577	7	460

[1] Adapted from the more detailed data of Table 1 in the report submitted to members of the American Association of Teachers Colleges.
[2] Cost in thousands of dollars.
[3] Includes: aeronautics 1, armory 1, bowling alley and courts 1, dairy 1, dining halls and cafeterias 7, faculty apartments 3, faculty club 1, farm shop 1, field house 2, home management house 1, hospital 3, infirmary 3, laundry 2, maintenance shop 1, memorial building 1, museum 2, president's residence 11, store 1, sewage disposal plant 1, little theater 2, student cottages 4, student-faculty building 1, utility building 2.

TABLE 2

NEW BUILDINGS NOW UNDER CONSIDERATION FOR 98 MEMPER INSTITUTIONS OF THE AMERICAN ASSOCIATION OF TEACHERS COLLEGES, AS REPORTED MARCH 1945[1]

TYPE OF BUILDING	EASTERN		SOUTHERN		N. CENTRAL		WESTERN	
	No.	Total Cost[2]	No.	Total Cost[2]	No.	Total Cost[2]	No.	Total Cost[2]
I Administration Buildings	..	....	2	455	..	....	1	90
II Auditorium Buildings	5	950	2	280	4	1,052	4	1,030
III Classroom Buildings (general)	3	940	2	325	5	1,760	2	426
IIIa Art Buildings	1	250	3	525	2	338	1	104
IIIb Education Buildings	..	....	..	....	2	375	..	....
IIIc Health Buildings	2	600	2	200	..	....	1	70
IIId Home Economics Buildings	1	310	2	130	..	....	1	197
IIIe Industrial Arts Buildings	4	1,296	3	223	9	1,852	4	850
IIIf Music Buildings	1	250	1	80	3	1,303	3	579
IIIg Physical Education Buildings	4	1,335	4	1,250	4	760	..	....
IIIh Science Buildings	2	425	7	1,550	6	1,945	6	1,909
IV Dormitories (men or women not indicated)	4	1,350	6	1,093	7	3,580	2	1,050
IVa Men's Dormitory Buildings	7	1,025	4	584	5	1,275	1	180
IVb Women's Dormitory Buildings	2	225	6	1,003	11	3,320	2	190
V Gymnasium Buildings	4	894	1	250	4	667	1	375
Va Men's Gymnasium Buildings	..	....	..	....	1	200	1	288
Vb Women's Gymnasium Buildings	..	....	1	125	1	350	..	....
VI Heating-Power Plants	5	1,031	3	255	3	765	3	544
VII Library Buildings	11	2,035	5	700	14	3,795	2	390
VIII Laboratory School Buildings	3	1,043	1	125	5	1,640	1	200
VIIIa Nursery School Building	..	....	..	....	1	50	..	....
VIIIb Elementary School Buildings	..	....	..	....	1	350	1	231
VIIIc Secondary School Buildings	2	865	..	....	2	575	..	....
IX Student Center or Activity Building	4	635	2	150	4	950	1	220
X Stadiums	..	....	..	....	4	450	..	....
XI Swimming Pool	..	....	1	40	..	....	..	....
XII Total Plants	1	750	..	....	1	300	..	....
XIII Unspecified Function	..	....	..	....	3	3,400	1	75
XIV Miscellaneous[3]	6	402	6	543	4	898	2	342

[1] Adapted from data in Table 4 of the original report.
[2] Cost in thousands of dollars.
[3] Includes: chapel 3, dining hall 1, faculty apartments 2, field house 1, grounds 3, home management 1, hospital 1, infirmary 2, laundry 1, museum 1, Pan-American House 1, president's home 4, research 1.

ceived in answer to this request are contained in Table 2. This table shows the types of buildings that are being planned, the number of each, and the probable cost.

The buildings are grouped according to the principal purpose to be served by the building and by geographical areas.

The data in Table 2 show that the proportion of the members of the American Association of Teachers Colleges whose reports are included have plans in mind for the construction of new buildings to the amount of $67,787,000 for the postwar period. If the other third of the institutions had plans to the same extent, the total would probably be in the neighborhood of $100,000,000.

The presidents were requested to indicate which of the proposed buildings had already been approved by the appropriate authorities and for which ones the probability of getting them was considered "good." From their answers, it appears that 40 per cent of the proposed buildings have already been approved and that for another 35 per cent the probability of getting them is "good." This would mean that approximately $75,000,000 in new buildings was a probable figure for the immediate postwar period.

An analysis of the data in Table 2 shows that the buildings that are proposed in greatest number are: (1) classroom buildings, including 79 buildings for special subjects, such as science and industrial arts; (2) dormitories; (3) libraries; (4) laboratory schools; (5) auditoriums; (6) heating-power plants; and (7) student centers.

Resources to Draw on in Making Plans

It is obvious that most of these buildings will have to fit into a physical plant already in operation and will therefore have to be carefully adapted to the present and future needs of the institution. In the planning of such buildings *all* available resources should be drawn upon because mistakes are not only costly to rectify but often are of such a nature that they impose a real handicap on the educational program to be carried on in that building as long as it is used. One of the resources often neglected is the faculty group that will make greatest use of the building. They should be consulted in the early stages of planning for a new building and should probably be represented on any committee to follow through to the final plans. Valuable ideas about some buildings, especially classroom buildings, libraries and dormitories, may often be obtained from students.

An excellent set of suggestions for utilizing all available resources in planning for new buildings are contained in "Tomorrow's Libraries for Teachers Colleges," prepared by Carter Alexander for the Committee on Standards and Surveys of the American Association of Teachers Colleges and available from the office of the Secretary of the Association, President



A PWA allotment built this electric power plant at State Teachers College, Morehead, Ky. Federal aid was responsible for much construction at teachers colleges during the past fifteen years

Charles W. Hunt, State Teachers College, Oneonta, New York. Price $1.00.

Numerous other suggestions are contained in *Standards for College Buildings* † which has been approved by the Committee on Standards and Surveys of the American Association of Teachers Colleges as a basis for evaluating physical plants of normal schools and teachers colleges.

Other helpful general references are:

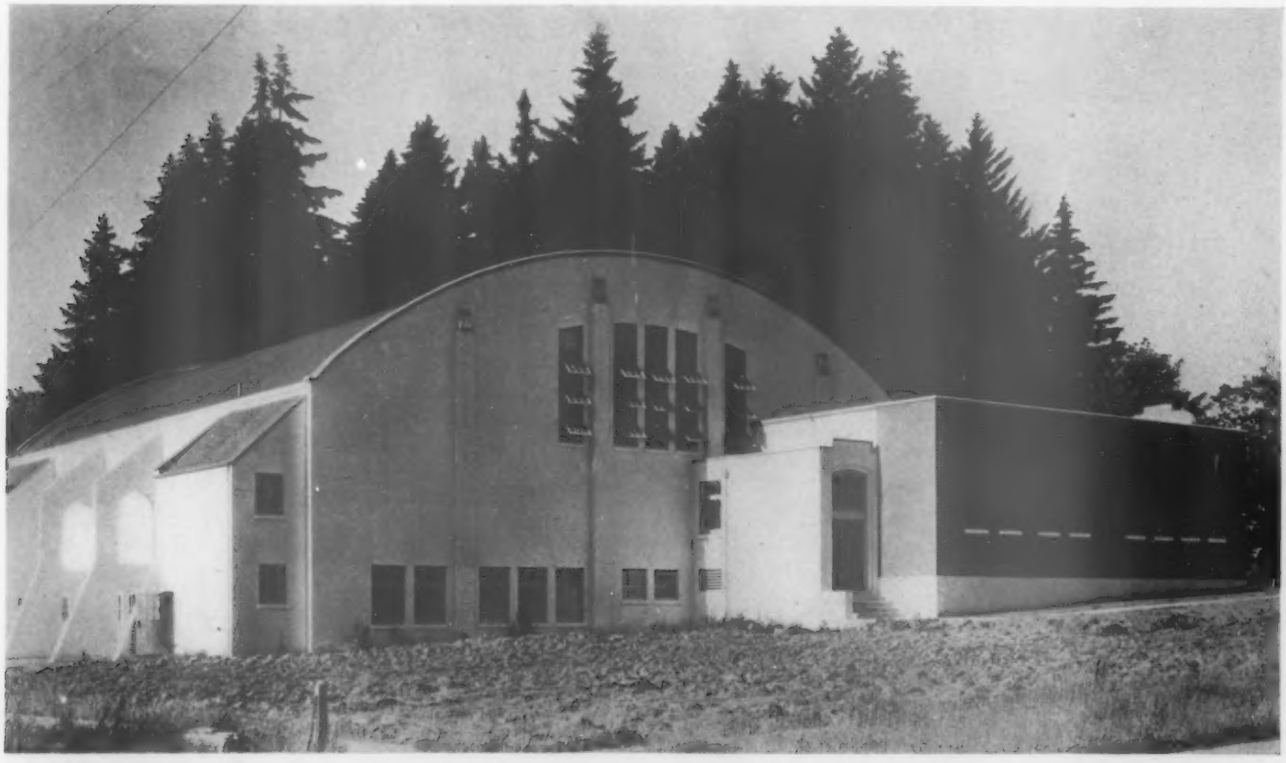
HAYES, HARRIET. *Planning Residence Halls for Undergraduate Students in American Colleges and Universities.* New York: Teachers College Bureau of Publications, 1932.

KLAUDER, C. Z., & WISE, H. C. *College Architecture in America.* New York: Charles Scribner's Sons, 1929.

PALMER, ARCHIE M. & LARSON, J. F. *Architectural Planning of the American College.* New York: McGraw Hill Book Company, 1933.

Many suggestions will also be obtained for total plans, and for specific features of various buildings, from the recent volumes of THE AMERICAN SCHOOL AND UNIVERSITY. A planning committee for new buildings should have access to a wealth of illustrative material before it visits other buildings. Such committees should construct check-lists of items and services to be included, so that none of the desired ones will be left out when final plans are accepted.

† E. S. Evenden, G. D. Strayer, and N. L. Engelhardt, *Standards for College Buildings*, New York: Teachers College, Bureau of Publications, 1938. 226 pages.



At Oregon State Normal School at Monmouth, PWA funds made it possible to replace an old, unsafe gymnasium with this structure



College Elementary School at the Central Washington College of Education, Ellensburg, Washington

CAMPUS "LABORATORY" SCHOOL BUILDINGS

By LAURENCE D. HASKEW

Executive Secretary, Committee on Teacher Education of the American Council on Education, New York, New York
On Leave from Emory University, Georgia

THE operation of a school for children has been an important part of the American, as well as the Prussian, tradition of teacher education. According to the latest information available, approximately two-thirds of the teachers colleges and colleges of education operate a children's school on the campus and, in spite of certain developments to be treated later, there is no identifiable trend toward abandonment of the practice.

If campus schools for children are to be operated, what should the school plants for them be like? Are there special characteristics which such buildings should possess? Are the equipment needs at all unique? What considerations should be taken into account in planning for new buildings of this character, or in remodeling old buildings?

To suggest answers to such questions is one of the objectives of the present article. Of necessity, it confines its subject matter to the campus "laboratory" school; however, it is hoped that the procedures employed in reaching answers to the questions are illustrative of good procedures to employ in planning any school plant enterprise, and that the conclusions reached will be suggestive for all sorts of schoolhouse construction.

Function of the Campus School

It is obvious that the functions to be served by a given school unit should determine the housing and equipment of that unit. It is not easy to determine what the campus schools now in existence are attempting to do; it is even more difficult to decide what they should do. Yet, decisions must be reached if planning is to be foresighted rather than imitative in character.

What is needed is not generalized statements of function which obscure or gloss over fundamental is-

sues, such as "to provide an opportunity for prospective teachers to observe and participate in good teaching." Getting common consent to such general principles may seem to be good diplomacy, but it does not presage effective, clear-cut planning. There are definite issues involved in selecting the functions to be served by a given school; those issues should be faced. The attempt to be eclectic, failure to have the issues understood, frequently results in disappointment and dissatisfaction; lack of clarity is particularly dangerous when a thing as permanent as a school building is being planned. Let us, then, look at some of the issues.

Scope of Service

Is the primary function of a campus school to bring children together into groups so that they can be observed or studied? In that case, the corresponding school building would have careful provision for observation space, but otherwise would be little different from the average schoolhouse in the area. Facilities for operating a complete, modern program for children might not be deemed necessary—college students could see these in nearby public schools when they were serving off-campus apprenticeships.

On the other hand, the first responsibility of a campus school may be to offer a thoroughly serviceable total school program to the community clientele which it serves. It must serve adults as well as children, it must act directly to bring about community improvement, it must seek to meet all the needs of all the children who attend it, and it must give adequate attention to those who do not.

It is easy to conclude that no issue is involved here; if budgets had no limits perhaps there would be none. Budgets do have limits in this vale of tears, and somewhere an observation balcony for the new building is going to be weighed against a social unit for the community; the salary of a research specialist in children's emotions against the amortization of the cost of a gymnasium.

Super-normality

Many maintain the position that the campus school should exemplify typical conditions, striving in all things to be just a little bit better than the average, just slightly left of center in philosophy, only a little broader in the scope of services provided. No doctrine of pure mediocrity, this view holds that the teaching should be excellent teaching of its kind, that thoroughness should be outstanding. Those who take this position are particularly insistent that the physical facilities should be little different from those typically provided in public schools: the classrooms should be rectangular cubicles, specialized rooms are not necessary, high-cost aesthetic features are impractical, and so on.

There are others who hold that the campus school should be a model. Its curriculum should be the best that the parents, pupils, and faculty can think up; its teaching procedures the exemplification of what teaching methods should be; its community program a tangible evidence of the democratic philosophy. In similar vein, the school plant—both building and equipment—would be what was needed to further a model program. If a library room twice as large as any other public school library in the state were indicated, it would be provided; if special projection rooms were thought to be the best means for providing for the use of visual aids, they would be set up.

Just to complicate the issue, two other points of view should be recorded here. Some leaders hold to the notion that the campus school should take the ordinary sorts of physical provisions and show what can be done to approach model conditions through homemade adaptations "that any teacher can make or get made." There are others who contend that the campus school should be frankly experimental, and they don't want the word "experimental" defined too scientifically. In the building realm, they would like to see a college build a school composed of group-living units, for example, or really go all out in the use of color and the employment of newer ideas of fenestration.

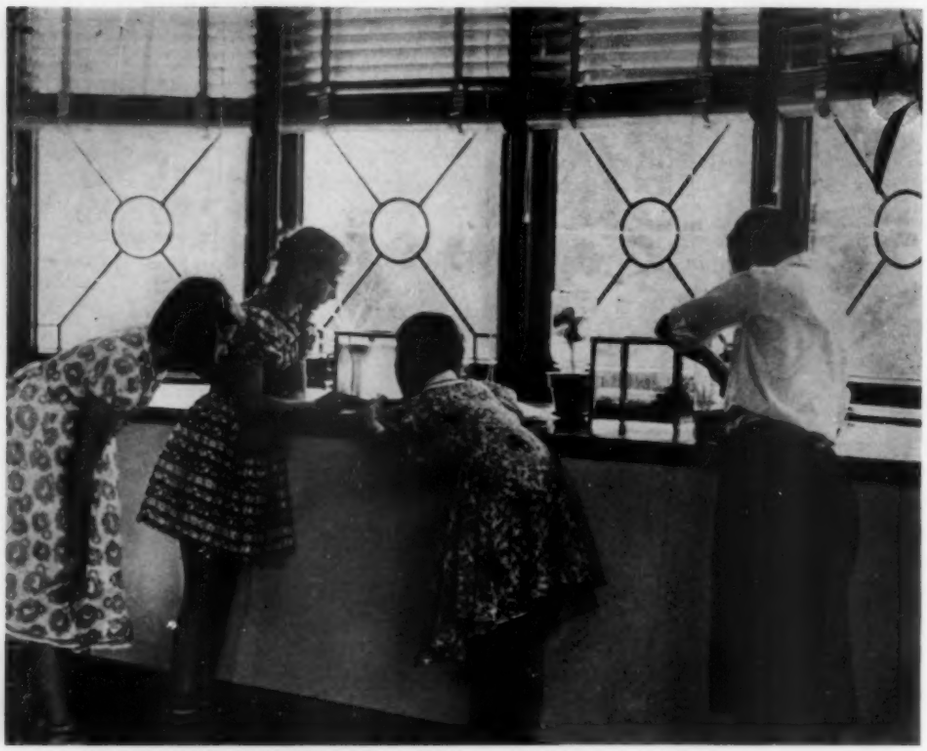
It is not at all uncommon to find persons on a single college faculty who hold to each of these points of view and who are attempting to influence the campus school program according to the views they hold. This is confusing enough, but when many individuals are found who apparently hold to all these orientations at one and the same time, the situation gets really complicated—and the frustrations multiply. It is perhaps fortunate, from the psychiatric viewpoint, that an architect can be brought in and made the scapegoat for all the failures to recognize issues.

Demonstration or Participation?

The campus school exists chiefly because it furnishes an audio-visual aid for classes studying education, according to one point of view. The instructor in child psychology will take his classes to see principles



Does the responsibility of the campus school encompass the community? Or is it primarily a laboratory for study of children?



Will the laboratory school offer a model program? Or will it attempt to show what can be done to approach a model program under typical school conditions?

of learning in operation, and the teacher of method will use it for demonstrations of teaching procedures. It is generally assumed that observations will be scheduled as definitely as laboratory periods in the natural sciences and that the observing groups will be of about the same size as college classes. If such use is to be of first consideration, the building must provide rather elaborate facilities for observation groups. At least two or three rooms will be constructed with balconies screened from the children's space by one-way vision material; perhaps an observation theater will be provided.[1] The outdoor play area for early childhood groups will be equipped with elevated grandstands; rooms used for conferences between teachers and individual pupils will have built-in observation cubicles.

In other colleges, the study of children and of teaching processes is conceived of as an active, participatory process on the part of college students. The emphasis is upon the student's becoming, from the very first, a member of child groups, a worker with individual children. In this sort of program the college students are part of large class groups very seldom, operating chiefly in pairs or individually. Elaborate, formal school plant facilities for observation become much less important than provisions for small groups of children to get together under good working conditions. Classroom suites with three or four separated work areas take precedence in the building plans; so do special purpose rooms with appropriate equipment.

If funds for constructing a campus school building were unlimited, this issue would indeed be a straw man; both types of facilties would be provided in the hope that they would be used. Building funds, however, are always limited, by the taxpayers even if not by the conscience and intelligence of educational designers. Decisions have to be made, and they should be made in the light of functions to be served by the building. The writer recently visited a campus school building in which elaborate provisions for observation balconies had been made at a cost, including bond amortization, of approximately forty thousand dollars; he was told that the balconies had been used by college classes twice during the preceding semester. At the time he was there, four college students were attempting to work with separated groups of first-grade children in a single room forty feet long and twenty-one feet wide.

Practice Teaching

In some colleges, the campus school is expected to carry the full load of practice teaching for the college students. With the growing emphasis upon practice teaching as the core of pre-service preparation in such colleges, it will be essential that far more elaborate physical facilities be provided in the campus school building than has been the case typically. The minimum of three workrooms per grade group suggested by Evenden, Strayer and Engelhardt[2] will be just a starter. Many special purpose rooms—shops, music, drama, for example—will be indicated; greatly expanded audio-visual services, evaluation centers, materials collections, facilities for outdoor education, and similar service repositories should be provided. Particularly important will become the necessity for giving supervisors the best chance possible to work with student teachers, and for college students to work at their teaching jobs. Excellent office-conference cen-

[1] Sketches of such layouts will be found in A. R. Mead, *Supervised Student Teaching*. Richmond: Johnson Publishing Company, 1930. Pp. 634-64.

[2] E. R. Evenden, G. D. Strayer, and N. L. Engelhardt, *Standards for College Buildings*. New York: Bureau of Publications, Teachers College, Columbia University, 1938. Pp. 206-214.

ters for supervisors will be needed; so will expanded library facilities and materials services right in the campus school; so will study rooms and meeting places for the many groups who will need to get together.

In other colleges, the campus school is expected to help prepare students for practice teaching. Sometimes this preparatory experience is concentrated into one semester or quarter; in other cases it extends over a two- or three-year period. The major load of practice, or apprenticeship, work is carried by off-campus schools. The chief implication of this program for the campus school building is in the quantity of facilities which will be provided, the detailed nature of specialized plant modifications. What will the preparatory program be like? How many students will it serve? What physical provisions will best expedite the process? These are typical questions which are forerunners of building planning.

Special Emphases

This is an aspect of the issue of super-normality which has been stated earlier. Should the campus school operate a program which will give special or atypical attention to phases of education which the college staff thinks are important, even if those emphases are lacking in the average school program? Should the campus school of the University of Tennessee (it does not have one as a matter of fact) go all-out in promoting resource-use education, although most schools in Tennessee do little about it? Should Milwaukee State attempt to do an outstanding job in intercultural education? Is Western Michigan justified in paying so much attention to outdoor education?

If special emphases are to be the order of the day, school plant provisions can facilitate the realization of the objectives sought. Resource-use education can be furthered by a proper school site, special laboratory provisions, facilities for trips. Intercultural education may need community-assembly rooms, enlarged play areas, special provisions for recreational use of the school plant. Outdoor education will be furthered by a building design which presupposes children's being out-of-doors a great deal, by the provision of school camp sites, nature museums, and transportation equipment.

Determination of Function, a Local Matter

Perhaps this section should conclude with a statement of what the functions of a campus school ought to be. It will not. The determination of functions is a local matter, to be arrived at through a process of real participation by all the persons who are going to help the campus school find its place in the teacher-preparation sun. When this has been done, the first step toward planning a good campus school building has been taken.

But what about the blueprint stage of planning? What are some of the things for which planners should be on the lookout, which they should call to the attention of the architects and educational superintendents of building? Users of campus school buildings should prove to be one fruitful source of ideas; an examination of trends in teacher education should be another fruitful source.

What Users Think

In January 1946, an inquiry was addressed to the presidents of 186 teachers colleges and the deans of 85 university colleges of education. Four questions were asked:

1. *What features of your present building have you found to have outstanding usefulness in terms of the*



Is emphasis on observation of teaching procedures? Or will the college students do active work with small groups of children? Will the campus school carry the full load of practice teaching for the college students?

functions served by your campus laboratory school?

2. *What additional features would you give high priority if you were designing a new building for a campus children's school?*

3. *What features of your present building would you like to see eliminated?*

4. *Do you contemplate the early construction of a new building to house the campus children's school?*

The persons addressed were requested to have answers to these questions formulated by teachers in the campus school, directors and principals of such schools, college teachers of education, and college students. The response was gratifying. Replies were received from 143 colleges and universities, 52 per cent of those addressed. Of those responding, 44, or 31 per cent, stated that they did not operate a campus school for children. A total of 212 persons filled out inquiry forms on the 99 buildings reported in use. Approximately forty-five per cent of the responses were from directors of training and principals of schools, twenty-eight per cent came from supervising teachers, fifteen per cent from college presidents, seven per cent from deans and heads of departments of education, and five per cent from college instructors not on the campus school staffs. Only two responses from students were received.[3]

What building features did these users consider important? It was relatively easy to arrive at some clear indications by a tabulation procedure which compared the responses to the first three questions. For presentation purposes it is thought desirable to describe these features under two headings, those features which are teacher-preparation centered and those which are school-program centered. Obviously, no clear line of demarcation can be drawn between these two classifications, and their usefulness is limited to purposes of clarity in exposition.

Teacher-Preparation Features

A suite of rooms for each grade came in away ahead in the tabulation of things most desired and most desirable. Such suites do, or would, consist of a large (600 to 900 square feet) central room; two or three work alcoves or connected rooms (200 square feet each); a commodious, separated office for the supervising teacher (240 to 360 square feet); and appropriate storage space and toilet facilities. Half-glass fixed partitions separating units were mentioned often, although some desire was expressed for fold-away partitions which would really work.

The campus school should be located in close proximity to the college buildings used for the education of teachers, respondents agreed. Most persons whose building housed college classes, as well as a school for children, favored a separate building or a separate wing for the children's school, but some of those who had separate buildings stated that "we are not getting the close integration in the work of our staff which we used to get when we all worked in the same building."

Adequate office space and conference room for supervisors of student teaching was accorded high priority. So was the provision of a work-study room and a recreation lounge for the student teachers. Like the superstitious preacher in Dr. Willis A. Sutton's famous anecdote, the respondents were inclined to wax profane about a classroom "that ain't got but one do'!" Almost all seemed certain that the basic classrooms should be at least fifty per cent larger than those typically built into public school buildings.

Specialized provisions for observation facilities were not individually popular. Three users cited favorably their observation arenas—double-sized classrooms with raised seats at the ends or sides; several nonusers thought that one such room per building should be provided. On the other hand, two users thought that the special demonstration room was wasted space. A similar division of opinion was evident in regard to screened, one-way observation balconies. Five users cited them favorably, three listed them as features to be eliminated; only ten persons cited them as additions they would like to see made. Here is a good illustration of confusion as to functions to be served.

Service centers designed to serve prospective teachers in developing "know-how" as well as to serve children or regular teachers were mentioned several times. A library suite designed to function as a real materials bureau with room for student teachers to work and observe was an example quoted frequently. Health, psychological, and research units were also named with this particular idea apparently in mind.

School-Program Features

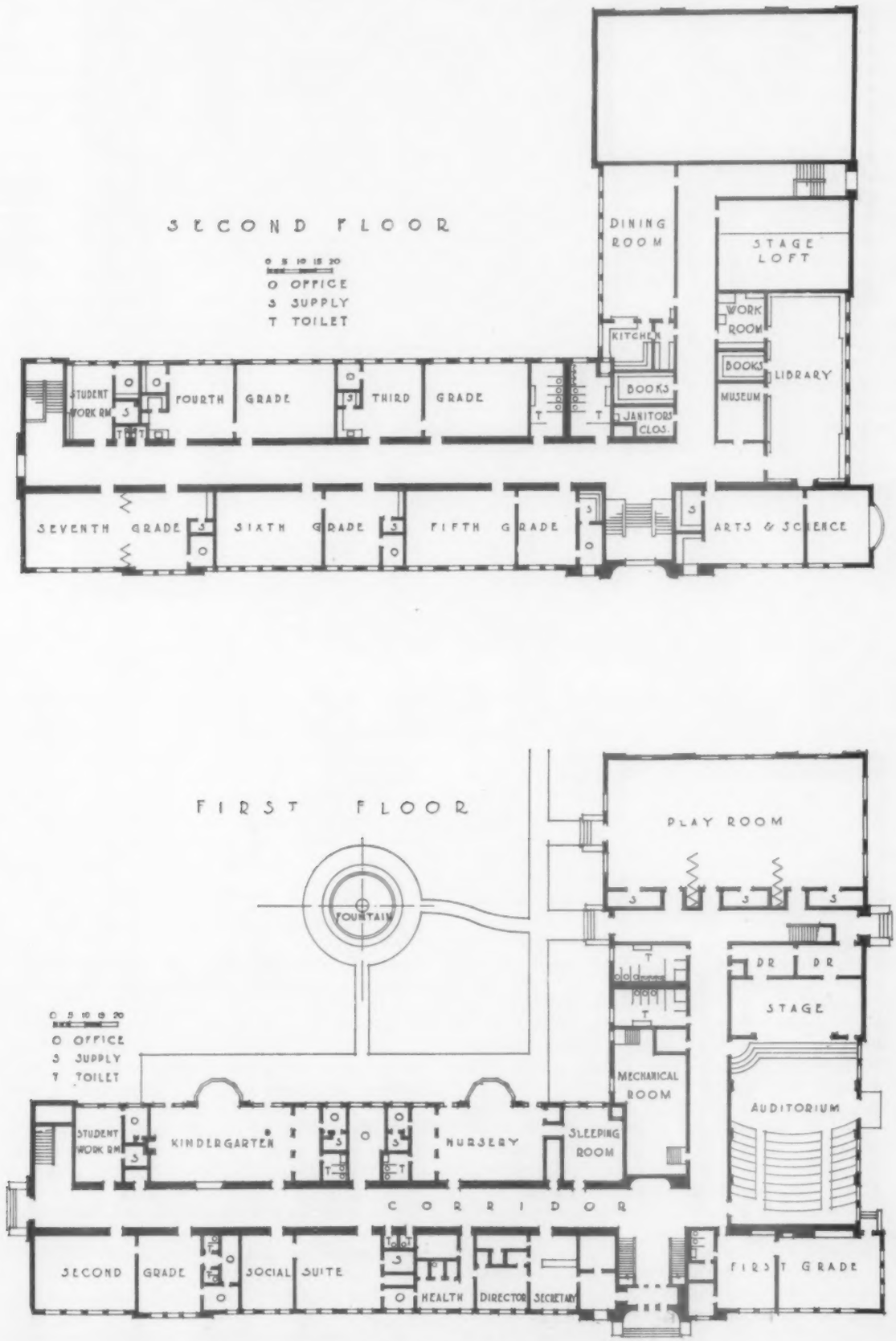
Only two persons expressed the opinion that the campus school building itself should be experimental in character, far advanced in design; both these persons wanted to develop "units-for-group-living" as the components of a new-type school plant. Others contented themselves with more traditional adaptations and expansions.

High on the frequency-of-mention list were special purpose rooms: music, art, general shop, science, social studies, and drama. A surprisingly large number of persons thought that a special visual-aids projection room should be provided. The library received a lot of attention, from the have-not's as well as the have's. Auditoriums with stages "really designed for use by children" would be welcome additions in many schools; combined auditorium-gymnasiums could be bought at bargain rates from those who have them, and auditoriums used jointly with the colleges seemed to be a particular pain in the neck. The need for more play space, both inside and outside, was general; fully-equipped gymnasiums were desired frequently as additions, but were named not at all as desirable features of present plants.

The major chorus was in favor of more space—over 90 per cent of the respondents wanted larger classrooms, for example. The high priority given to well-designed storage provisions was impressive. Considerable dissatisfaction was expressed with existing arrangements for caring for children's clothing and other belongings; an appreciable number said "take the children's lockers out of the classroom," and an exactly equal number said take them out of the halls. Office space was in considerable demand, and lunchrooms were typically too small.

It was clear from the additional features listed as desired that most of the respondents thought that their

[3] It is impossible to treat here the uses to which these schools were being put. For a recently published study of such utilization the reader is referred to E. I. T. Williams, *The Actual and Potential Use of Laboratory Schools in State Normal Schools and Teachers Colleges.* Teachers College Contribution to Education, Number 846. New York: Bureau of Publications, Teachers College, Columbia University, 1942.



Floor plans of the College Elementary School
Central Washington College of Education

building designs hampered them in providing children with enough physical-activity, noise-producing work. The request for acoustical treatment of rooms, corridors, and cafeterias was widespread.

A few people asked for "social units" which could be used by community adults, as well as children, in out-of-school hours; only one group reported such a unit as a desirable feature of their present building. Considerable mention was given to the provision of a health suite, to waiting rooms for parents, to lounge rooms for teachers. Not mentioned once were direct community-service facilities such as canning plants, repair shops, baby clinics, organization meeting rooms.

Aesthetic features aroused comparatively little concern. There were a few requests for more color, a few commendations of fresh, airy appearance, one mention of landscaping. More bulletin board and display space came in for a little wishful attention; too much blackboard space for about the same amount of derogation.

In summary, we can say that campus school staffs seem to be thinking of school programs in about the same ways public school staffs are thinking of them. The big plea is for room and more room; special equipment is frequently wanted, but whether and how it would be used remains an unanswered question.

Trends in Teacher Education

There are several trends and promising developments in the field of teacher education which have appreciable import for the planning of campus school buildings. We can do no more than list some of them here.

1. The movement toward providing for long-extended, intimate contact with children as one major organizing center for a prospective teacher's learning. Non-classroom situations are demanded; close individual study is emphasized. The objective is to grow in understanding of children as contrasted with growing in understanding of how to get children "to do what they're supposed to do."
2. The growing attention to the provision of full-time apprenticeship for prospective teachers, chiefly in off-campus centers not operated by the college concerned.
3. The increased emphasis upon the development of community understanding through direct participation in the life of the community.
4. Attempts to give prospective teachers an adequate grasp of the total school program and abilities to work in that program in a variety of ways, as contrasted with the development of specialized skill in mediating a certain kind of knowledge.
5. The tendency to make direct experience the basis for all work in professional education; the development of the team concept of working with students on problems rather than the traditional approach of "theory first, then application, then practice."
6. The apparent tendency to shift college-sponsored experimentation from the campus school to public school centers.
7. The renewed interest in carrying special curriculum torches in teachers colleges: resource-use education, consumer education, international education, etc.
8. The increasing impact of programs—exceptional children, adult education, child counseling, for examples—demanding specialized preparation and therefore special practice facilities.
9. The increased emphasis on "general education" in the college curriculum, with the frequent accompanying postponement of the time when prospective teachers can have access to a children's school.

High-Priority Features

It is obvious that the campus school building should be safe, should be health-promoting, and should be economically-designed to promote the development of the kind of school program which is contemplated. Since it is part of a teacher-educating institution, it needs certain facilities not normally placed in a public school building; it needs characteristics of design which are somewhat peculiar; and it needs to exemplify in its physical provisions those functions which it is obligated to serve.

Among the special facilities which are needed, the following would seem most commonly applicable: offices for supervisors of teaching, a room reserved for group-conferences of student teachers, workrooms, and personal storage space for the college students. The building should be readily accessible to all those who should use it, should minimize distracting influences by the provision of such things as well-planned entrances and exits, acoustical treatment, segregation of noise. Each supervising teacher should have a well-appointed individual office in which conversational privacy can be assured.

The outstanding characteristic of the design should be flexibility, since the building must serve such a multiplicity of purposes and age-groups. Perhaps the design should begin with the provision of storage space and then move to the service areas. Full utilization of multi-purpose rooms will be needed in the plans; every advantage should be taken of mechanical developments such as vanishing partitions, swinging blackboards, and artificial illumination. Since future re-grouping of space will be particularly important in these buildings, the structural design must facilitate the changing of partitions and the addition of units.

Possible Functions

Before turning attention to some of the functions which campus schools might serve, it is well to reiterate the statement that the determination of functions is a local responsibility, that there is no proven hierarchy of functions, and that the most common mistake is for a school to attempt too many functions, rather than too few. With those cautions in mind, let us now list a few *possible* functions for campus schools and below each list—in a roughly preferential order—some suitable physical provisions.

A. *Providing conditions under which prospective teachers can work with and study children intimately.*

1. Classroom suites which contain two or three small work-conference rooms.
2. A health center with a private interview room; a clinic-testing center similarly equipped.
3. Indoor and outdoor play space with much equipment for individual and small-group activities for younger children; recreational rooms for in-school and after-school use by older children.
4. Two or three conference-interview rooms not attached to classrooms.



Will intimate contact with children in non-classroom situations be stressed? In planing a building for a campus school, a clear formulation of the program is a requisite

5. A records center, freely accessible to student teachers at all times. (Of course, it would help if some records were in it.)

B. *Providing conditions under which prospective teachers can do supervised leadership in groups of children.*

1. See A 1.
2. Equipping most classrooms as learning laboratories—movable furniture, collections of materials, work facilities.
3. Providing facilities for trips, for recreational events, for living in camps.
4. Providing double-sized classrooms.
5. Providing unit-type playgrounds and gymnasiums.
6. Providing private dining rooms or alcoves, workrooms for student activities; work and committee rooms as part of library, etc. NOTE: When student teachers take over whole class-groups, they will make use of all the facilities of the building of course; to list them would be needless in this article.

C. *Providing conditions under which college students may be directed: observation of prospective teachers at work with children or with an individual child.*

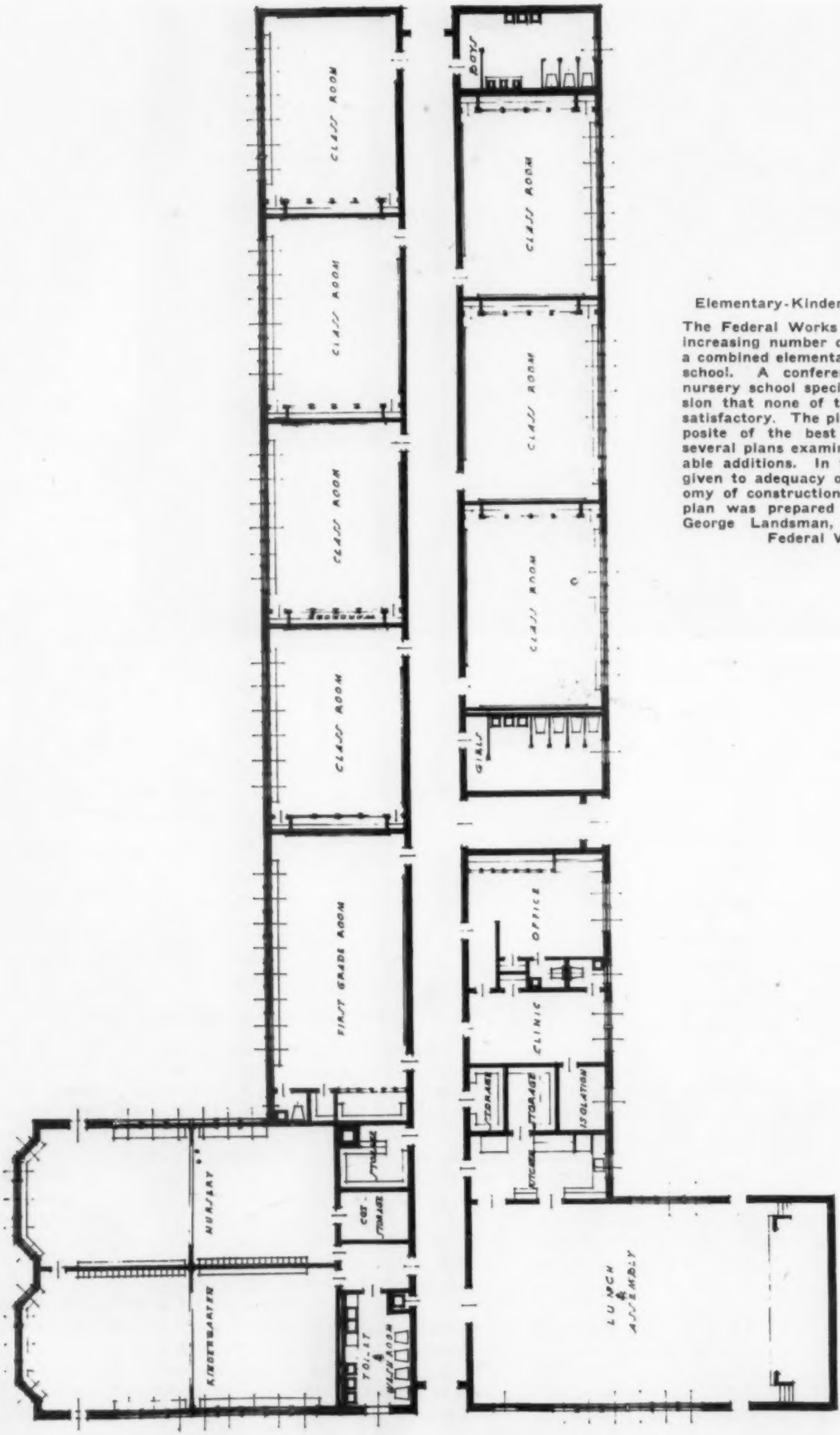
1. See A 1.
2. Providing observation balconies with one-way screens in three or four classrooms.
3. Providing enlarged classrooms.
4. Providing a single demonstration arena, which can also be used for a variety of other purposes.
5. Equipping one or two interview or clinic rooms with observation cubicles.

D. *Providing a channel through which college students may be brought into direct participation in community life.*

1. Setting up direct-service community facilities, such as canning plants.
2. Establishing rooms especially designed for use by adult groups.
3. Providing community recreational facilities.
4. Equipping suitable rooms with exhibits, informational charts, and similar materials.

What Should the Decision Be?

Deliberately left unsettled is the question of the kind of school program a campus school should attempt to operate and the school plant it should provide to house that program. If the decision is to furnish typical conditions, planning the building will not be difficult; all that is necessary is to look at enough school plants and strike an average. If the decision is to carry the torch for a few major ideas, to carry out a few "progressive" or "modern" specialities, the task of planning becomes more involved, but there is help available in the general literature on school buildings. If the decision is, as the author would probably make it, *to operate the best school program which can be devised and financed for the particular community and children which the school serves,* planning becomes difficult but adventurous. Here, too, the literature offers some help, but sheer experimentation will offer more.



Elementary-Kindergarten-Nursery School

The Federal Works Agency is receiving an increasing number of requests for plans for a combined elementary-kindergarten-nursery school. A conference with kindergarten-nursery school specialists led to the conclusion that none of the available plans were satisfactory. The plan shown here is a composite of the best features found in the several plans examined, together with desirable additions. In this design, emphasis is given to adequacy of facilities and to economy of construction and of operation. The plan was prepared by R. A. Kappler and George Landsman, architects, Division 2, Federal Works Agency

CONTRIBUTION THE FEDERAL WORKS AGENCY CAN MAKE TO THE PLANNING, DESIGNING, AND CONSTRUCTION OF SCHOOL AND COLLEGE BUILDINGS

By WILLIAM H. COLEMAN

Chief Specialist on School Facilities, Federal Works Agency

THE War Mobilization and Reconversion Act of 1944 in Section 501 (Title V) provides that "(a) In order to encourage states and other non-federal public agencies to make advance provision for the construction of public works, the Federal Works Administrator is hereby authorized to make from funds appropriated for that purpose, loans or advances to the states and their agencies and political subdivisions to aid in financing the cost of architectural, engineering, and economic investigations and studies, surveys, designs, plans, working drawings, specifications, procedures, and other action preliminary to the construction of such public works: *Provided*, That the making of loans or advances hereunder shall not in any way commit the Congress to appropriate funds to undertake any projects so planned."

Succeeding paragraphs prescribe the distribution of the appropriation among the several states; direct that the advances must be repaid when construction of the planned work is begun; authorize the Federal Works Agency to prescribe rules and regulations, and define "state" as including the District of Columbia, Alaska, Hawaii, and Puerto Rico.

Events Preceding Appropriation

Experience of the depression years led Congress to give early consideration to the need of advance planning for the years immediately following the war. In 1942 Major General Philip B. Fleming, Federal Works Administrator, called the attention of Congress to the hundreds of millions wasted early in the depression when funds had to be spent on quickly improvised projects because detailed plans for sound public works were not available. He reviewed the work of the Public Work Reserve and its successor, the Local Public Works Programming Office, and recommended that this activity be expanded. Funds for continuing the programming work, however, were terminated as of July 1, 1942.

The trend toward making provision for constructive planning was given further impetus in February, 1944, by the report of Bernard M. Baruch and John M. Hancock on "War and Postwar Adjustment Policy." They advised the early preparation of engineering and design plans and suggested a fund be created to assist local bodies in such planning. The Public Works Advisory Committee, established by various branches of the construction industry under the chairmanship of E. Lawrence Chandler, to advise the Federal Works Administrator, called attention in 1945 to the lag between the conception of a project and its construction due to the time consumed in preparing plans, overcoming legal difficulties, voting bonds, acquiring sites, advertising for bids, and letting contracts. The committee commended Congress for acting constructively by enacting Title V of the War Mobilization and Reconversion Act and advised continuance of the program with increased appropriations.

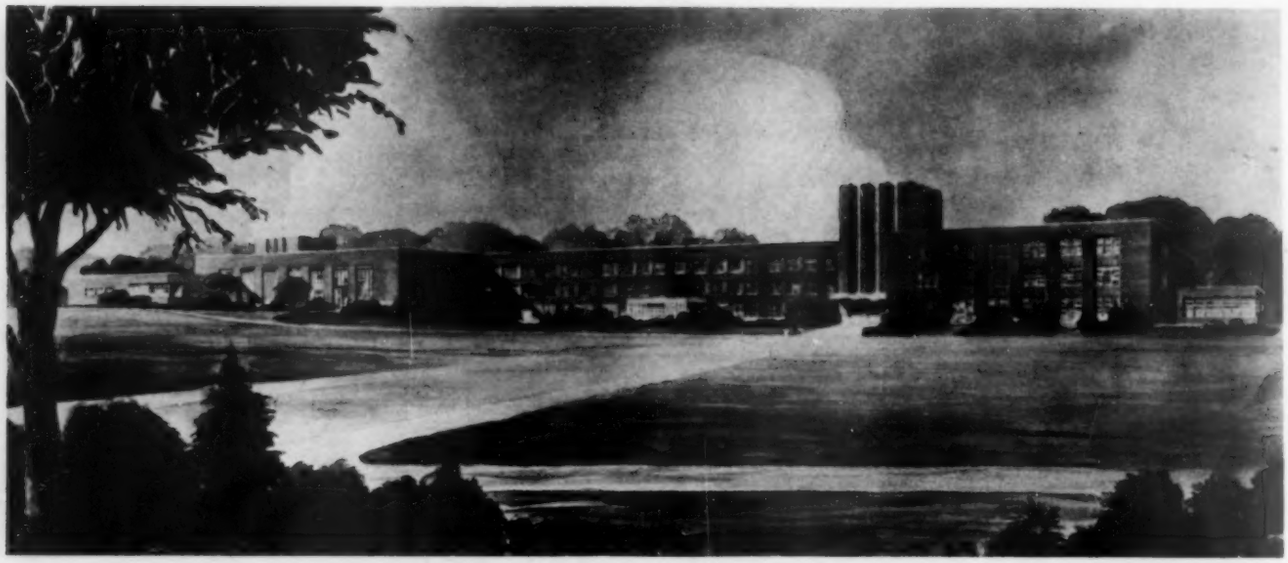
In a message to Congress on October 18, 1945, President Truman recommended that the initial planning appropriation of $17,500,000 be supplemented by an appropriation of $50,000,000 for the fiscal year 1946 and contract authority for an additional $57,500,000. After a full discussion by Congress this amount was reduced to $12,500,000. A total of $30,000,000 therefore has been appropriated for this purpose.

Policies and Procedures

The act specifies that no interest is to be charged for the advances made and that such advances must be repaid as soon as the planned construction is undertaken. Before any application for an advance is granted, the proposed project must be approved by any existing overall state, regional, or local planning agency. This authority as far as it relates to schools often resides in the office of the chief state school administrator.

When an application is received by a division office of FWA, it is referred to the control section where it is numbered and officially acknowledged. It is then examined for completeness. For instance, an application for planning a school building is expected to indicate the potential pupil load, the number of classrooms and auxiliary rooms proposed, and the estimated cost. Any available sketch plans should be included with the application.

The application is next referred to the legal section to determine whether the applicant has legal authority to finance and construct. The finance section ascer-



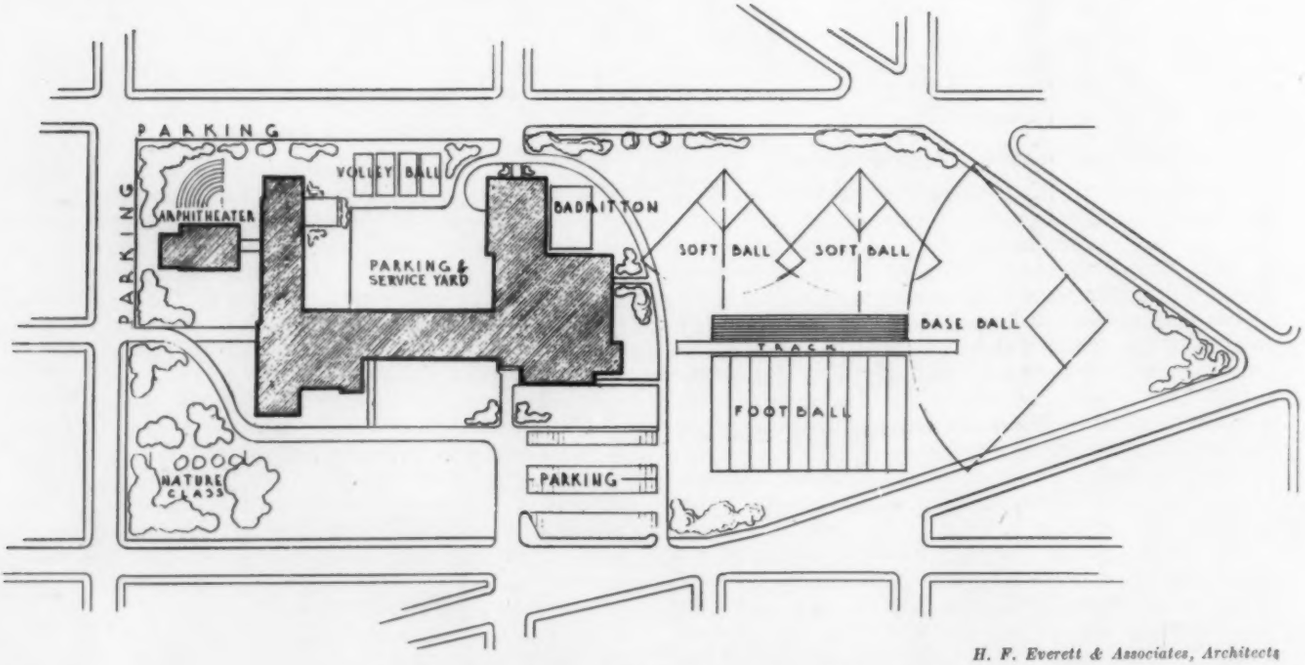
Central Junior High School, Allentown, Pennsylvania

Central Junior High School is one of the buildings the school district of Allentown is planning with the assistance of $125,000 made available by the Federal Works Agency. The district is proud of its planning and architectural set-up, which is described on page 66. It is also proud of two unusual features it is planning to incorporate in its new buildings: unique planning of the cafeteria for use as a classroom and conference room at other than cafeteria hours, and a social science instruction unit. Although not worked out to the final stage, these provisions can be seen in the floor plans of the Central Junior High School. The cafeteria eating area will consist of a number of rooms in which rather large area-ways can be provided by opening double or triple doors. The areas will be about classroom size and furnished in different styles. That is, one area may be Spanish, one Old English, one modern American, etc. The social science area will be composed of a performance area, a working area, and a reception area. It will also include a museum or exhibition area. This unit will probably call for the combined activities of three teachers.

Comment by J. Chester Swanson, Allentown's director of curriculum and research, on the aid rendered by the Federal Works Agency is as follows:

"The federal funds for planning made it possible for us to begin the specific planning phase at an earlier date than would have been possible otherwise.

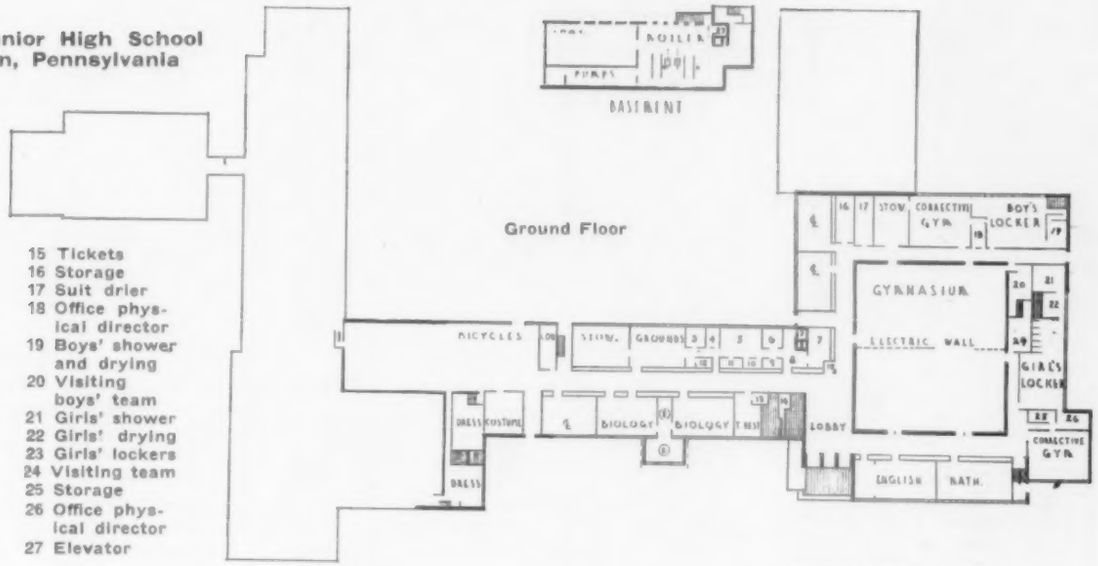
"Another important advantage was the psychological effect. That is, our local school administration had made considerable and extensive plans on which to base the building program. These plans had been presented in detail to the board and to the community as a whole. When the Bureau of Community Facilities not only approved the plans but commented rather highly on them and even backed up their commendation with $125,000 in federal funds, it put us, at the local level, in an excellent position to prove to our local citizens and administrative board that our planning was reliable, adequate, and worthwhile."



H. F. Everett & Associates, Architects

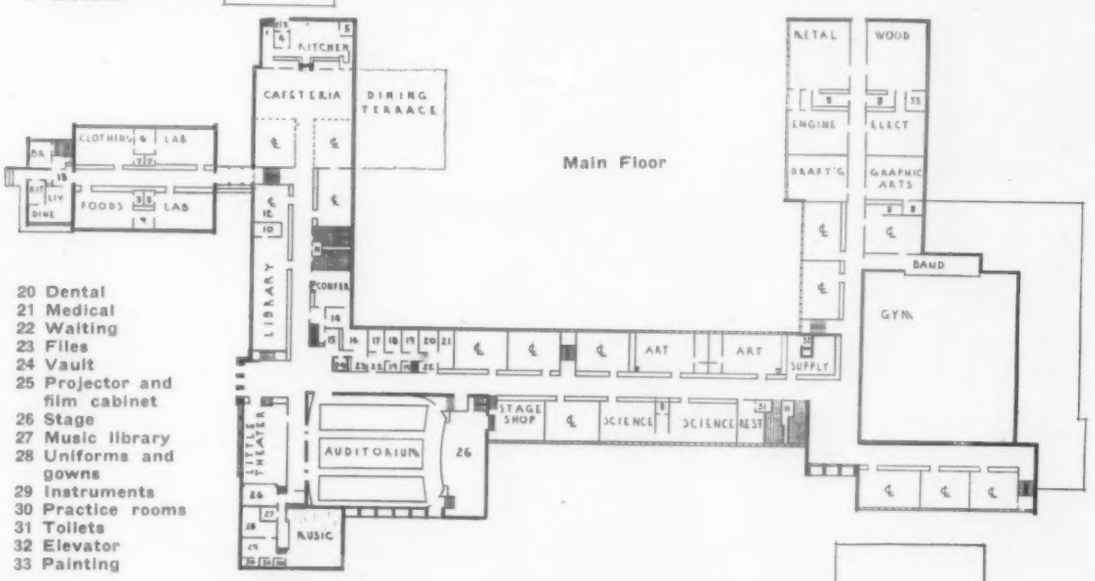
Plot plan, Central Junior High School, Allentown, Pennsylvania

Central Junior High School
Allentown, Pennsylvania



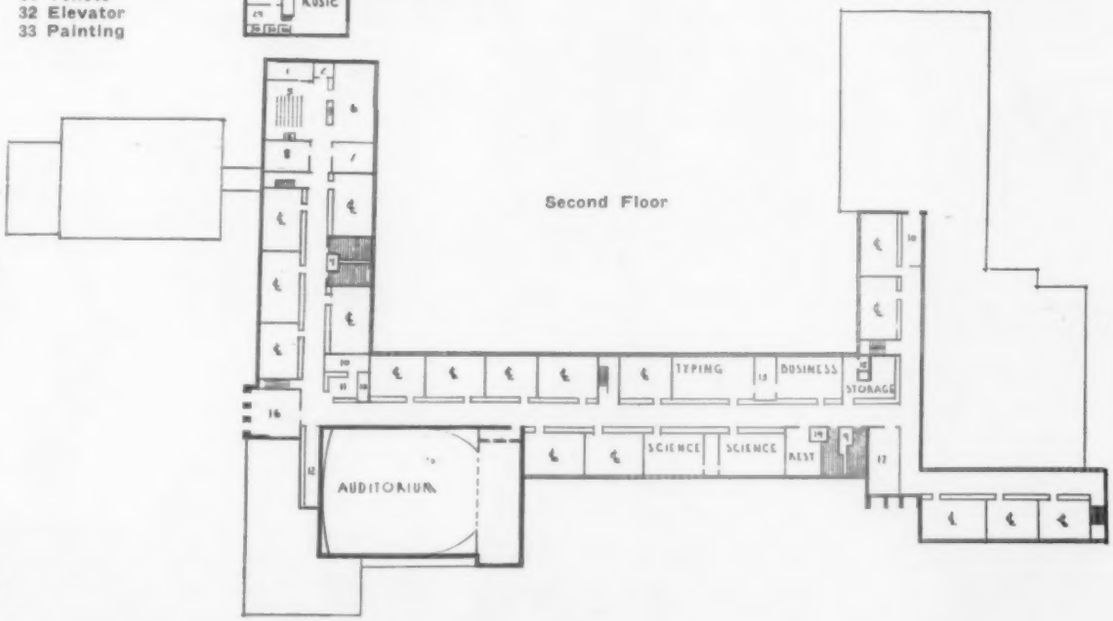
Ground Floor

Legend:
1 Storage
2 Greenhouse
3 Lunchroom custodian
4 Office
5 Repair
6 Paint
7 Supplies
8 Receiving
9 Cleaning
10 Tools
11 Electric service
12 Toilet
13 Toilet
14 Janitor
15 Tickets
16 Storage
17 Suit drier
18 Office physical director
19 Boys' shower and drying
20 Visiting boys' team
21 Girls' shower
22 Girls' drying
23 Girls' lockers
24 Visiting team
25 Storage
26 Office physical director
27 Elevator



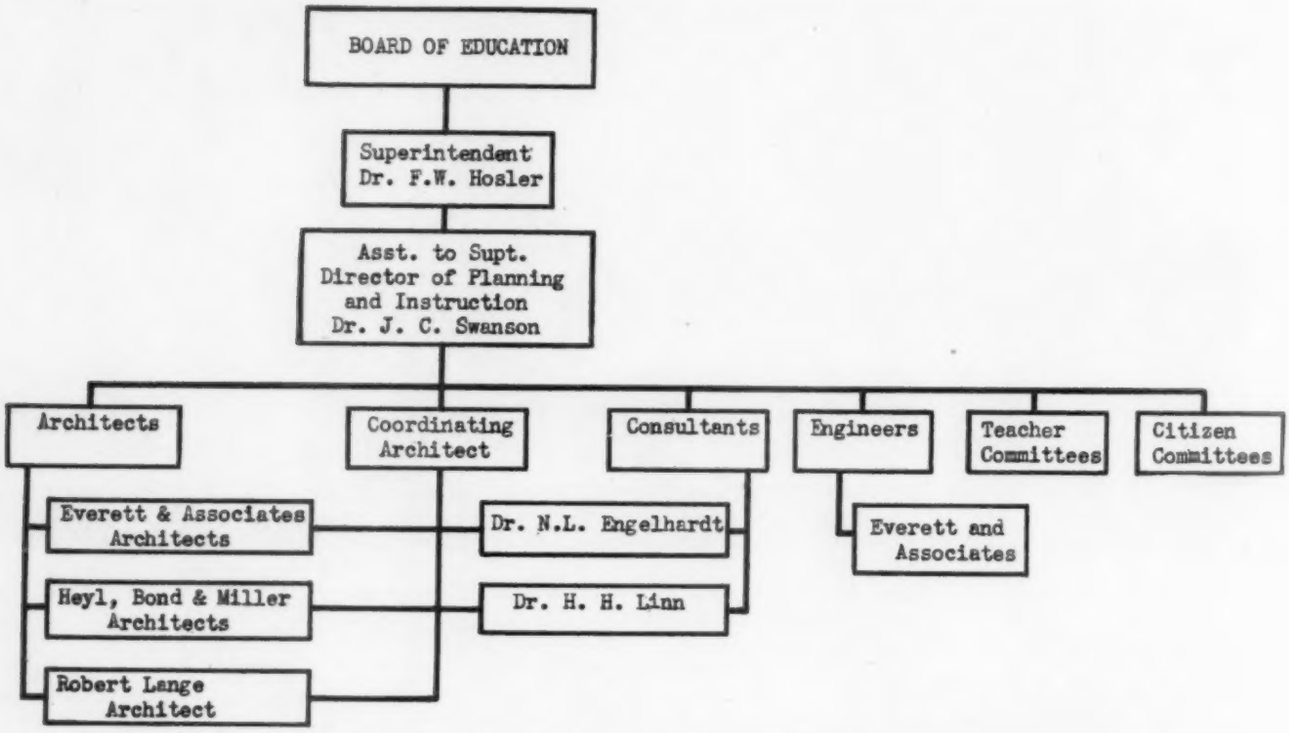
Main Floor

Legend:
1 Toilet and rest
2 Garbage
3 Entry
4 Food storage
5 Dietician
6 Laundry
7 Fitting
8 Storage
9 Unit kitchen
10 Workroom
11 Janitor
12 Library class
13 Model home
14 Principal's office
15 Waiting
16 General office
17, 18 Guidance
19 Cots
20 Dental
21 Medical
22 Waiting
23 Files
24 Vault
25 Projector and film cabinet
26 Stage
27 Music library
28 Uniforms and gowns
29 Instruments
30 Practice rooms
31 Toilets
32 Elevator
33 Painting



Second Floor

Legend:
1 Stage
2 Storage
3 Display
4 Projector and film cabinet
5 Lecture
6 Social science workshop
7 Conference
8 Library (science)
9 Janitor
10 Storage
11 Store
12 Projection booth
13 Business machines
14 Toilets
15 Elevator
16 Student activity
17 Photography
Note: Social science unit is 1 to 8 inclusive



Architectural Planning Set-up in Allentown, Pennsylvania

The coordinating architect is the head architect in one of the architectural firms. His duty is to evaluate the work of all the architects and to standardize procedures and planning where such standardization will produce economy in construction or labor and operation of plants.

Dr. Engelhardt and Dr. Linn are primarily educational consultants. They are assigned to specific buildings and, therefore, to the architects for these buildings.

The business of the engineers, who are members of one of the architectural firms, is to make engineering studies, primarily with a view to improving existing heating and lighting installations. They are assigned, for engineering evaluation, specific facilities in certain buildings. When the recommendations of the engineers are approved, the architects will devise specifications for purchase or installation of new equipment.

The teacher committees discuss the proposed plans and the way in which they fit in with the planned educational program. The committees cover the various phases of the program, such as physical education, music, administration, and counseling, and the teachers who compose them come from schools throughout the city. Equipment will be devised, and probably changes made in the plans and layouts, in accordance with the discussions and suggestions of these committees.

tains whether the applicant can finance the project within its legal bonding limit or otherwise. The school authority, for instance, is required to provide evidence that it can finance the project from non-federal sources. School project applications are then sent to the Public Buildings Administration where they are subjected to technical scrutiny to determine whether the proposed structure can be built within the estimated cost. If the ascertained cost exceeds the applicant's financial ability, he is so advised in order to enable him to revise the scope of the project to bring it within his financial resources.

When cleared in the office of the Division Engineer, the application is transmitted to the Federal Works Administrator for approval. Upon receiving his concurrence, the Division Engineer wires an approval notice to the applicant, followed by the text of an agreement and a public voucher. When these are returned duly executed to the Division Engineer, a copy of the voucher is forwarded to the U. S. Treasurer who sends the applicant a check for 50% of the approved advance.

The applicant immediately thereafter selects an architect to prepare complete plans and specifications. When 90% of the time estimated by the applicant for this work has elapsed, a form is sent for a report on final plan completion, together with a requisition for the balance of the funds allotted. When the planning is completed, these forms are returned to the Division Engineer, along with two sets of plans and specifications which must bear the approval of any state or other agency whose approval is required by law.

Final drawings and specifications, when submitted, are examined by FWA engineers to determine whether they are clear, adequate, and complete enough to fully inform prospective bidders and to preclude any reasonable misunderstanding of intention during the performance of a contract predicated thereon. Obvious errors or omissions in architectural drawings and specifications found in this review are called to the attention of the proper authorities so that they may correct them.

Advantages

Those who have made use of advances under this procedure claim the following advantages:

(1) Assurance of prompt payment tends to enlist the services of the best architects. Heretofore architects often have been engaged to prepare preliminary

plans before the issuance of bonds, only to find that when the voters failed to approve the bond issue designed to provide construction funds, they could not legally be compensated for services rendered. As a consequence, this type of work generally has not attracted the best architects and even those who have accepted such contingent commissions often have been reluctant to put forth their best efforts in advance of definite assurances that they will be reimbursed.

(2) When complete plans and specifications are available, the public can be clearly informed as to the probable cost, scope, and location of the project for which they are asked to vote bonds.

(3) The community has reasonable assurance that the proposed project can be constructed for approximately the amount estimated. Costs can be closely estimated by the local architect, and his estimate is carefully reviewed by FWA specialists intimately acquainted with both local and national conditions and construction costs and trends. The procedure tends to remove the risk that an additional supplemental bond election may be needed or that plans must be completely revised.

(4) A minor advantage lies in the fact that the advance involves no interest payments and that local investment funds need not be risked for plans which later fail to materialize in construction due to an adverse bond election or for any other reason.

(5) Acceptance of an advance does not decrease bonding authority.

(6) The procedure carries with it the advantage of plan review by experts in building construction, including those specialists who have reviewed and analyzed hundreds of plans for schools from all sections of the nation. Attention can be called to structurally desirable improvements and to ways of promoting better mechanical functioning of the building; to the non-availability or shortage of materials called for in plans and specifications, and even, on occasion, to the possibility of improved educational functioning. Throughout, however, it is clearly understood that such suggestions are merely advisory, to be accepted or rejected as the community itself may determine. It is the responsibility solely of the community to engage the architect and to select and to develop the project plans.

Funds for Construction

Not only does this planning program provide no funds for the construction of school buildings, but the act explicitly states that "the making of loans as advances hereunder shall not commit Congress to appropriate funds to undertake any projects so planned." Furthermore, the most recent appropriation act, Public Law 269, provides that no federal agency may make a loan for the construction of any public works "plans for which have been wholly or partly financed out of this appropriation except in pursuance of a specific authorization." This clause proscribes construction loans for local public works by the Reconstruction Finance Corporation.

There are before Congress, however, several bills looking toward eventual aid for local public works. Many of these are based on the proposal mentioned by Messrs. Baruch and Hancock that plans be prepared, as was stated, "to fill in the valley of unemployment."

The basic data supplied by the Special House Committee on Postwar Economic Policy and Planning bear out the statement made by the Chandler Advisory Committee that the "construction industry experiences extreme fluctuations, far more pronounced than the upward and downward variations of the overall economy." Both committees indicate that the ability to initiate construction promptly when necessary is the essence of any public works program if it is to be effective in relieving unemployment. Both committees caution against undertaking work for the sole purpose of unemployment relief, however, if it involves unnecessary construction or competes unfairly with private business activity.

Construction Stabilization Act (S. 1449), introduced by Senator James E. Murray of Montana, October 2, 1945, proposes to aid in the stabilization of construction. Senator Murray disclaims any intention of seeking to fix any particular level of construction activity. He does seek to eliminate the violent fluctuations to which the industry is chronically subject. He calls attention to the importance of the industry in the whole economy by pointing out that new construction normally accounts for about 11% of the total national income and stands second in importance only to agriculture. (Maintenance, repairs, remodeling, etc., cover an additional three per cent.) He charges that "inactivity in construction is synonymous with depression." The bill proposes, among other things, to appropriate $150,000,000 for advance planning to "build up and maintain a non-federal reserve of planned public works construction projects amounting to approximately 5 billion dollars." This bill differs from Title V of the War Mobilization and Reconversion Act in that it provides for advance planning as a continuing function and contemplates maintaining a six-year advance planning program at all times.

The bill sets up committees designated as the Public Works Stabilization Committee and the Construction Industry Advisory Committee to advise the President on ways and means of adjusting and harmonizing federal, state and local public works programs and private construction. It is to be noticed in this bill that, although no construction funds are to be appropriated, it looks in the direction of providing the essential data should another depression emergency require federal stimulus for the construction industry.

The House Special Committee on Postwar Economic Policy and Planning, of which William M. Colmar of Mississippi is chairman, reported that "in the event of a period of widespread unemployment—one that is not within the ability of the state and local governments to cope with—it becomes the responsibility of the federal government to meet the issue on the level of national welfare."

The Thomas Bill (S. 1123) and Stigler Bill (H.R. 4151) "in order to avert widespread unemployment" would authorize an appropriation of a billion dollars a year for three fiscal years "for public-works projects." The Neely Bill (H.R. 4499) authorizes the appropriation of one and one-half billion dollars in federal aid for the planning and construction of "effi-

cient public educational plant facilities." This fund would remain available until June 30, 1952.

No hearings have been held by the committees to which the Thomas-Stigler and the Neely bills were referred. It is the considered opinion of well-informed persons that favorable action by Congress on any of these bills is unlikely unless a surplus of labor and materials for construction develops.

Status of Postwar Planning Funds

The following was the status of the postwar planning funds as of March 21, 1946:

Total amounts of applications received	$52,940,821
Total amounts of applications approved	20,316,433
Under review in Division Offices	$32,624,388
Amount of initial appropriations available for planning	$29,100,000
Allotted as per above	20,316,433
	$ 8,783,567

On March 21, therefore, there remained of the initial appropriation only sufficient funds to approve less than 30 per cent of the remaining applications on file.

Congress has appropriated for the advance planning of local public works an initial amount of $17,500,000, plus a deficiency appropriation of $12,500,000, making a total of $30,000,000 of the $125,000,000 recommended by President Truman.

Public officials have responded so favorably to the advance planning program that funds available in some states were soon exhausted. In fact, the demand has been so great that the National Municipal Review says that "Federal assistance in the preparation of local public plans is late in coming and on a niggardly scale." It seems probable that Congress is pursuing a deliberate course of appropriating only such amounts from time to time as will guarantee that this project will not compete with private business for the services of architects.

Originally the funds were allotted to the several states in proportion to their population. In some of the states the allotment is practically exhausted. On the other hand, in six states the allotment exceeds the total applications by $2,784,000. Some of the latter have large planning funds of their own from which grants—not loans—can be made. Others have varying reasons for not availing themselves of these funds, such as legal difficulties. Since the balance of $8,783,-567 can not be redistributed among the states and since this results in freezing $2,784,000 there is left available for actual use somewhat less than the amount of $6,000,000.

Advance Planning of Schools

On March 1, 1946, an amount of $5,731,114 had been approved for advance planning of schools and other educational institutions. The estimated construction cost of these projects was $185,246,890. In addition to this there was under review in the division offices applications for the advance planning of schools for a total of $14,891,503 which represents a construction cost of $451,888,737.

DESIGNING THE SCHOOL PLANT FOR MULTIPLE USE

By WILFRED F. CLAPP

Chief, Division of School Plant, Michigan Department of Public Instruction, Lansing

and LAWRENCE B. PERKINS

Perkins and Will, Architects, Chicago, Illinois

ECONOMY is only one reason for using a school plant as fully as possible.

It is true that buildings cost more then they ever did, and that they last a long time. It is equally true that return on such a major investment requires more than five or six hours use each day to justify it, but beyond this lies the full effectiveness of the educational program itself—the relations of students to parents, to the community, and to each other. These are the plus values from multiple use, or more accurately, from intensive use of the school plant.

The actual extent to which a school building will be used is only partly a design problem. A suitable design merely permits an activity to take place. The reality behind it is a dynamic program and the continuing energy to make it work. On the negative side, school authorities must remove obstructive regulations, architects must eliminate building limitations as far as possible. On the constructive side, the community must want something (or things), such as a drama club or a hobby shop, before the facility for it is worth having. Administrative leadership must channel this desire into action before it can become a measurable need. A good long look at other facilities in the community should precede extensive investment along any of these lines.

Two Kinds of Multiple Use

Basically, there are two kinds of multiple use of school plants. In one case, a room is adaptable to more than one kind of subject matter. In the other, it is usable by groups outside of the regular student body.

In the first category, a room is used for mathematics or science, for English or social studies. The cafeteria is used as study hall, social room, or band room. The gymnasium is also an auditorium. This is using the same space for different kinds of educational activities.

The other kind of multiple use overlaps the first. It is the use of the school building by other than "school age" groups for educational or other activities outside of "school hours." The shops, used by the children during the day, are used for adult farm machinery repair classes in the evening. The arts and craft rooms are used by hobby groups at night. The homemaking laboratories, used by school groups in the daytime, are also used by adult homemaking classes in the evening.

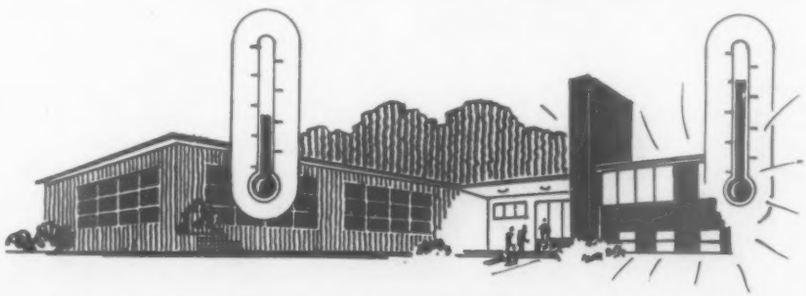
Principles That Must Be Observed

For the community to get the most from the school building during the evening and other non-school hours, a few general principles must be observed.

Obviously, any part of a building to serve crowds should be near the ground. Not only do the risks multiply as large groups are moved over stairs and down corridors, but also these factors constitute a mental barrier to the potential users which is minimized by letting them directly into the space they are to use.

Each part of the building used by the public should be operable separately. Separation from other physical divisions of the plant should be so planned that a single gate or barrier will accomplish the result as contrasted with having to run all over the building closing off corridors with gates, or worse still, locking innumerable classroom doors. General toilets should be located on the public side of the barrier.

Heating and ventilating should permit any major part of the building to be used while the rest is idle. A P.T.A. meeting in one or two rooms should not require heating the whole building or running a central fan. This is avoided by zoning and local unit ventila-



"heating the whole building . . . avoided by zoning and unit ventilation"

tion. Storage of wraps, of project material in process, and parking provisions are items for the check-list.

And last, while the building should be scaled to its primary users, the children, it should not presuppose adults who can be compressed or collapsed beyond reason.

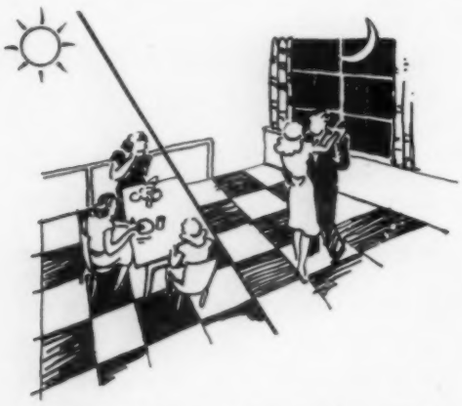
Planning Specific Areas

Let's take certain areas of the building and see what can be done with them to make them well adapted for either or both kinds of multiple use.

Cafeteria

The basic job is to provide a cheerful and convenient place in which to feed youngsters in a hurry. To do this job well, it should have relatively large clean spaces, readily moved tables and chairs, and plenty of acoustical treatment. It should have kitchen and serving facilities which can be isolated from the dining area by folding doors or other means.

For possibly two hours the cafeteria must do its basic job supremely well, but the space must find other uses during the rest of the day in order to justify its rather considerable capital cost. The cafeteria can also be used for music rehearsal, dances and dinner

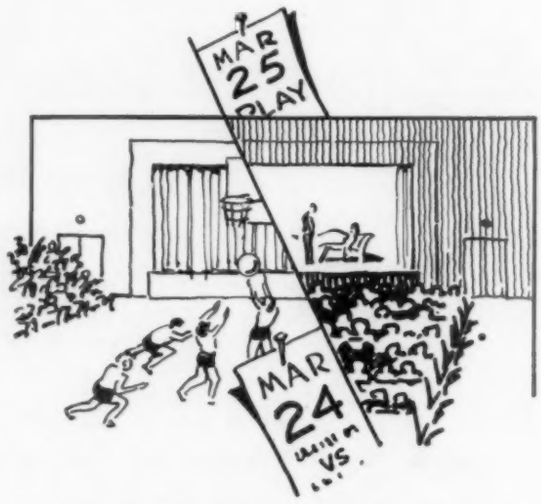


"the cafeteria can also be used for music rehearsal, dances, and dinner parties . . ."

parties, visual aids projection, or speech rehearsal. For any combination of these uses it is desirable to provide for darkening, to do an adequate job of ventilating, to make alternate seating and furnishing convenient, and, perhaps, to provide a small stage or platform. For all of these uses, location of the cafeteria near the auditorium is an advantage, since audiences can socialize there during intermission, and musicians will store instruments and rehearse near the stage.

Auditorium—Gymnasium

A school would be very small indeed if the name, "auditorium-gymnasium," did not imply conflict. The expanding importance of physical education runs directly afoul of the expanding speech, dramatic, and assembly programs of modern educators. You can't build up scenery and leave it in place while volley balls are flying, and what a beating prom decorations would take. Yet the authors of this piece freely



Auditorium-gymnasium implies conflict, yet "this compromise is frequently necessary"

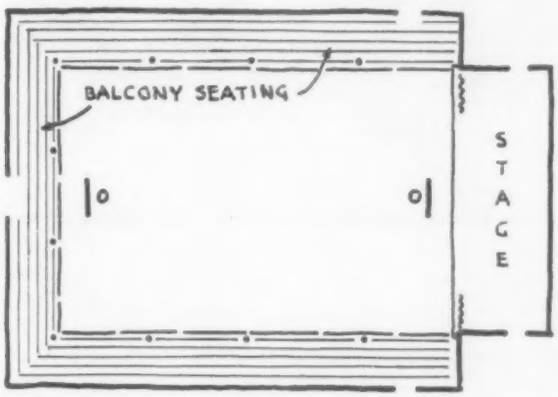
admit that this compromise is frequently necessary. Although the separation of these functions is not as expensive as is usually supposed, it does cost more (and accomplishes more).

The conflicts are unavoidable but can be minimized by careful planning. Here are some suggestions which may help:

1. Acoustics.—Important, and a relatively simple problem but often neglected entirely. We suggest acoustical treatment of the ceiling, and the use of cinder blocks for upper walls.
2. Spectator space.—Sometimes folding bleachers are used. They have the advantage of allowing more floor space for gym classes when they are folded back. Sometimes permanent balconies are provided across from the stage. Often these have been built high above the floor in order to get locker rooms under them with the result that spectators cannot see parts of the gym floor.
3. A satisfactory method of storing auditorium seating must be found. The space under the stage is often used for this purpose. Furniture should be lightweight, strong, comfortable, and occupy little space when folded (a rather large order, withal!).
4. Adequate storage space should be provided for gymnasium and stage equipment. If the stage is to be used to seat spectators during games, special attention must be paid to safe storage space for stage equipment, usually in the wings.
5. Don't provide a running track type of balcony.
6. Provide adequate locker and shower room space for both sexes—enough full-size lockers to accommodate the largest group to use the facility at one time; enough baskets or small lockers for all. Get the locker rooms up out of the ground—provide sanitary finishes, good lighting, and positive continuous separate ventilation. Let's not place these important health teaching facilities in dark, damp, underground space.

There has been a gradual transition in design from the first auditorium-gymnasium to the present. The

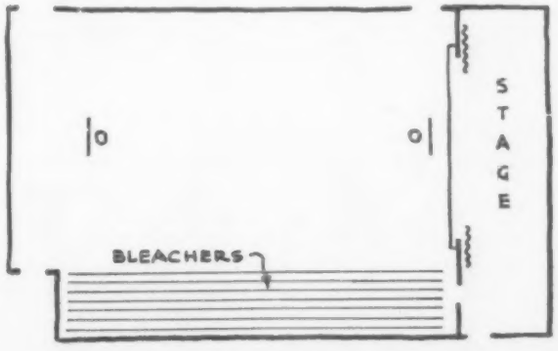
first combinations were made by simply building a gym and putting a stage at one end. In many cases spectator space for athletic contests was forgotten entirely, or the old-type running track was changed into a balcony around three sides of the room, designed with fiendish ingenuity so that only the first row of spectators could see anything of the game being



Step 1 in auditorium-gymnasium transition: Gymnasium and stage at one end; balcony around three sides

played below them, and they could not see parts of the floor. The stage apron was often a hazard to the players. The hanging movable basket was unsatisfactory, and the stage, draperies, and other equipment were damaged by flying balls.

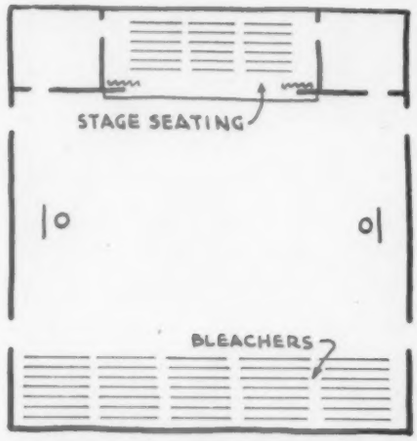
The next step in development still put the stage at the end of the long axis of the room but provided



Step 2 in auditorium-gymnasium transition: Permanent seating at one end; lockers underneath seating

permanent seating at one side. This was better than the other scheme but still had many weaknesses. Lockers were often located under the permanent bleachers.

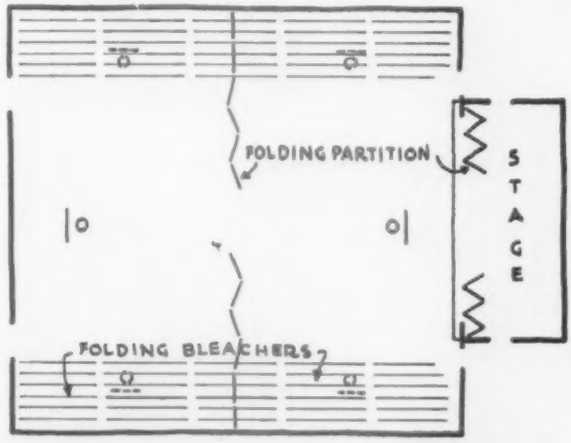
Step three located the stage across from the permanent bleachers, with the long axis of the basketball court running in front of the stage. The advantage of this plan is obvious. The balcony can be used for basketball or other athletic contests and for auditorium purposes. The stage can be used for seating for athletic contests. The disadvantages of having



Step 3: Stage located across from bleachers; court in front of stage

the stage at the end of the basketball court are removed. However, lines of sight are not too good when the gym floor is used for auditorium seating. A wide structural span is required, or posts must be located in front of the balcony. This general arrangement is most satisfactory when the facility is of medium size.

With the demand for larger gymnasiums, another scheme has come into prominence. This scheme pro-



Step 4: Two sets folding bleachers; folding partitions between stage and play area; and midway of large floor

vides recessing or folding bleachers on each side of the play court. The stage is located at the end of the long axis. Folding doors can be used to separate the stage entirely from the play area. Folding partitions are also provided midway of the large floor so that with the bleachers folded back, two play courts can be provided across the larger court.

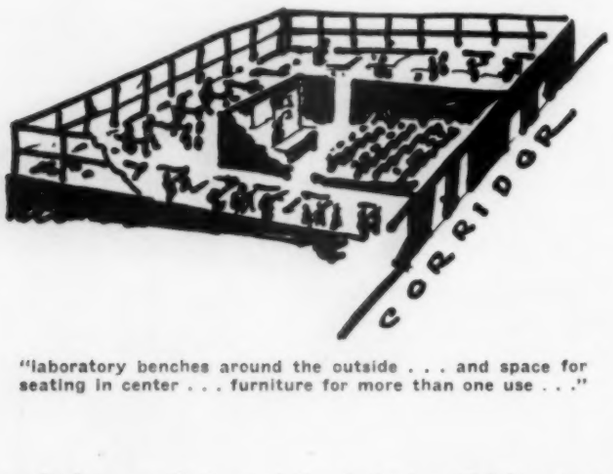
In all cases, if a combination gym-auditorium is going to be used, it *becomes practically imperative to provide a small auditorium elsewhere in the building.* Otherwise there is such a conflict of demands for the

larger room as to make serious administrative difficulties.

Science Suite

This has been an area of low utilization in many buildings. Frequently we find separate and distinct laboratories for physics, chemistry, and biology, with one or more science lecture rooms. We have no quarrel with this scheme if there can be effective utilization. This may be possible in larger schools. In the smaller high schools, however, such a scheme would lead to vacant facilities many hours of the day.

Can we not combine some of these facilities by careful planning? Will it not be possible to design a science laboratory which can be used for any science as well as for lecture, recitation, or study? Is there not now an instructional trend toward the integration of the sciences? Why not design a room with laboratory benches around the outside of the room and with space for class seating in the center? Steps have already been made toward the designing of laboratory furniture for more than one special use.



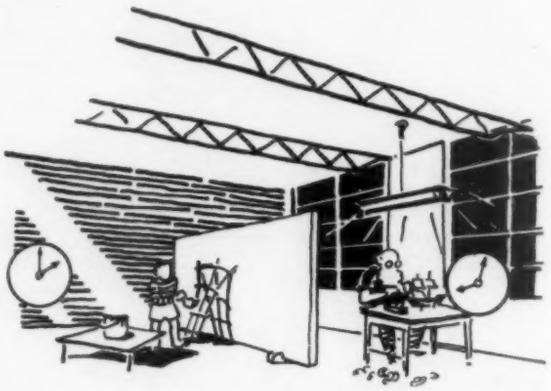
"laboratory benches around the outside . . . and space for seating in center . . . furniture for more than one use . . ."

Shops

First let's design our shops so that they have maximum internal flexibility. The shop, of all places, should not be so designed that it is frozen into one special use. In our larger schools we may need special shops for advanced vocational training, and even they should be built so that they can be changed easily to other vocational use. But in all schools, for all children, we need general shops.

Let's make our shop building more like a real shop and less like a schoolroom—one-story construction, large areas so designed that temporary partitions can be installed by the shop people themselves according to changing space demands for different kinds of activities.

Ferneries, tie-racks, and foot-stools? Yes, but much more. Our shops will be used all day by the school-age groups and all evening by other groups. The school shop will take the place of the home workshop when our modern homes are too small to provide space for it. Farmer Brown wants to find out how to repair his farm machinery, so we provide an opportunity for him to learn. Production-Line Jim wants to become a toolmaker. John Citizen wants to build a row boat or overhaul his outboard motor. Mr. and Mrs. Jones want to build some furniture or upholster that easy chair together. The school shop is the place to find out how to do it by doing it.



"Our shops will be used all day by the school age groups and all evening by other groups"

One big problem is where to store unfinished projects. There is no pat answer. Obviously some projects will be too big to store, unless we provide a special room with wide doors. Others may be stored in cabinets along the wall to keep them out of harm's way.

Another problem is the management of tools. There's no good answer to this either insofar as building design goes. Tool crib? Wall cabinets? Two sets of tools for day and evening groups?

The important thing is to locate the shop where it is easily accessible and can be operated separately, to design it so that it is inviting and suited to the activities it is to house; and to administer the program so that the public feels welcome in it and wants to make use of it.

Study Halls

When the high school instructional program is such that the pupil goes to class, listens, recites, receives an assignment, and then moves on it is plain that considerable study hall space is needed. No matter how well the daily program is designed, there are bound to be periods when the study hall is full to overflowing, and other periods when it is practically empty. Utilization percentages of this facility in most schools are very low. Furthermore most of these rooms are so designed that they cannot be used easily for other activities.

It is not the purpose of this article to try to reform high school programs, but it can be said that the trend is toward longer periods, toward laboratory rather than recitation techniques, and toward a broader program of general education. As gymnasium, shops, music rooms, laboratories, auditorium become more fully utilized, there will be less and less need for large, single-purpose study halls.

In some of the smaller schools, libraries and study halls are combined. In larger schools, where the type of program calls for study hall space, separate study halls are used. Real flexibility of construction will

help to bring about better use of space. Easily removable partitions, or telescoping or folding partitions, can be used so that the space can be easily expanded or contracted.

For ideal disciplinary conditions in the large study hall, there should be individual seating and stationary furniture. For maximum flexibility, movable furniture, tables, and chairs should be used. Then the study hall can double as a social room or small auditorium. A stage at one end will find frequent use. Some schools successfully use the cafeteria-dining room as a study hall.

Classroom

The usefulness of a classroom will be increased in proportion to the extent to which the room is more than four walls, a floor, and a ceiling. Cabinet, cupboard, display, and work space is just as necessary in a high school classroom as in an elementary room. Instructional trends in high schools indicate the extension of "learning by doing" to the high school level. Problem courses are appearing under various names. The trend seems to be to move toward integration of subject matter rather than toward further compartmentalization. In some schools, groups of pupils work together in one room or suite of rooms under the guidance of a team of teachers for as long as a whole half day. Problems worked upon cut across subject matter lines. Teachers who are trying to do this complain that the rigidity and specialization of different parts of the building hamper such integration.

They advocate a suite of rooms with connecting doors or archways. They maintain that this sort of classroom should provide for working rather than just sitting, and that rudimentary shop and science facilities should be provided. This would mean at least a work bench or benches, with some simple hand tools, a gas burner, and electric plate and sink. If this can be done, it will certainly make each classroom much better adapted for a variety of instructional uses by both children and adults.

Homemaking Rooms

If originally designed as real home-living laboratories, rather than as cooking and sewing rooms, these quarters will be adapted to use by adult groups in the evening. We should by all means avoid designing homemaking rooms so that they are frozen to one special use. Using space for model dining rooms, bedrooms, or living rooms is usually not justified. Better to have two general purpose home-living laboratories than one cooking and one sewing room. Home and family living includes more than cooking and sewing.

These rooms will be popular with mother groups. Let's locate them so that they are easy of access, first floor preferred. Abundance of storage space for unfinished projects should be provided.

Parents' Room

Why don't mothers visit schools more? We stress this during "Education Week" and at other times, but it just doesn't happen unless Johnny is in trouble. Have we really made it attractive for parents to visit schools? Why not have a place in the school where the parent always feels welcome. Such a room would provide a place to which parents might go first when they come to visit the school. Wardrobe space would be provided. This room would be a natural place in which P.T.A. committees, mother' study groups, and other small adult education groups could rest. Safe outdoor play space might be provided next to this room, where mothers of pre-school age children could park the young hopefuls while attending a committee meeting.

Will this be an extravagance? Not if the room is well used. We believe that if such a room were provided, and parents of the community were made to feel free to use it, we should find it used almost continually. Besides, it could also be used by student committees, teacher committees, and by other groups when not needed by the parents. It should be primarily a parents' room, however, and should be called just that.

Use of the parents' room dictates its size, shape, and appointments. Perhaps one-half or one-third class-



"a place in the school where the parent always feels welcome . . . in which adult education groups could rest

room size is large enough. Wardrobes have been mentioned. Adjacent toilet facilities for this room only are essential. Preferably a kitchenette should be built into this room, but if economy demands it, the room can be located near other kitchen facilities. The room should be attractively and comfortably furnished. Probably the best answer to the problem of designing it so that it will be most useful is to give a group of parents the responsibility of planning it themselves.

Community Education Program Comes First

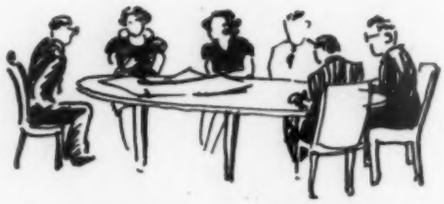
Which brings us to the subject of "cooperative planning." We started by saying that multiple use—particularly in its community aspects—should be the outcome of needs and desires which have been perceived and measured.

Cooperative planning means much more than a few conferences between the administration and the architect. It means that everyone who may use the building must enter into the planning. This includes parents, children, teachers, janitors, community leaders. It means the cooperative development of a community

education program—on paper and in some detail—as the first step in planning the needed building. Then, and only then, can the real planning of the building itself be successfully carried out.

This kind of planning will take much time and require a high type of educational leadership, not to mention more understanding of its limitations. It is easy for groups to come to conclusions such as: "It must be Georgian and two stories," in contrast to principles like: "We have a hobby program that is holding the town together. We must provide for seventy parents twice a week."

Cooperative planning will lead to many differences of opinion which will have to be resolved. But it will furnish an opportunity for much serious thinking about what the function of the community school really is and how its objectives can be realized. If well done, it will result in a really functional school building. Incidentally, this kind of planning is the best kind of public relations possible. The proposed building project becomes the community's project and not just another building project which must be "sold" to the people.



Cooperative planning, "best kind of public relations," will result in functional plan

THE VILLAGE COLLEGE IN ENGLAND

By H. C. DENT

Editor of "The Times Educational Supplement"; Author of "Education in Transition," "British Education," "The Countryman's College," "Life of Charles Dickens"

IT IS now nearly 21 years since Mr. Henry Morris, education secretary to the Cambridgeshire County Council, laid before his committee a memorandum on the provision of educational and social facilities for Britain's countryside. In that historic document he outlined a scheme for the erection of what he called "Village Colleges" in the rural areas.

Morris's proposals were the result of his realization, first, of a profound sociological truth: that "our civilization must, if it is to be healthy, always remain based upon the product of two cultures—an urban one and a rural one," and second, of an alarming sociological fact: that for a century or more English rural culture had been withering away. Its vitality was being steadily and increasingly drained out of it by the continued exodus to the towns of the ablest and most virile inhabitants of the countryside. His scheme was an attempt to arrest this process of devitalization.

It was based on three main postulates. First, that to restore to village life a sense of dignity, worthwhileness, and purpose, the people living and working in villages must be provided with as wide a range and as rich a variety of social services and amenities as people in the towns. Second, that the spread and expense of modern social services were so great that a single village could not support them: It was too small a unit to "provide the fuller life both culturally and socially that increased leisure and facilities make possible—and which," he added significantly, "the young are determined to have." Third, that the social and cultural life of any community should be based upon its educational institutions.

Morris's solution was to substitute the "rural region" for the village as the social and cultural unit of the countryside. His conception of a rural region was an area of, say, forty to fifty square miles containing half a dozen to a dozen villages and hamlets, and including a larger village which would serve as the center of the region. In this he proposed to build a village college.

Day School for Children, the Nucleus

The college he had in mind would "comprise and coordinate within a single range of buildings all the educational and social agencies, both statutory and voluntary, from pre-natal and infant welfare to agricultural, handcraft, and academic activities for adults," so as to serve the population of the region "at all points and all ages." Its nucleus would be the day school for children of secondary age,[1] but in addition to the school facilities there would be pre-natal and infant welfare centers, a nursery school for children from two to five, a junior (primary) school for children from five to eleven, medical clinics for children and adults, a library, art, handcraft and music rooms, theater, gymnasium, swimming pool, canteen, gardens, farm, and playing fields.

Many of these facilities could be used by children and adults alike—the former in the daytime, the latter in the evenings and at week-ends—but it was an essential feature of the plan that there should be an "adult block" of buildings, suitably furnished and equipped, for use by adults alone; and containing accommodation and facilities for educational, social, and recreative activities and for the transaction of public business by local statutory and voluntary bodies.

It was an equally essential feature of Morris's plan that the buildings of the village college should be sited in beautiful surroundings, architecturally distinguished, and equipped with taste and dignity.

The Education Committee of Cambridgeshire County Council thought well of Morris's scheme and, in 1927, decided, with the approval of the English Board of Education,[2] to build an experimental village college at Sawston, a village of some 1,500 inhabitants lying seven miles southeast of the university town of Cambridge. The rural region this college was intended to serve included nine villages and had a population of about 10,000 people, which included both industrial and agricultural workers. The total cost of the college was estimated at £16,000.[3]

Owing to the state of the law at the time,[4] while the school, estimated to cost £6,000, had to be built entirely at the public expense, a large part of the money necessary to provide the facilities for adults had to be raised by voluntary effort. Generous support was forthcoming. Mr. H. G. Spicer, owner of a paper mill in Sawston, and the village's largest employer, gave a site of twelve acres. His family gave £1,000. The Carnegie United Kingdom Trust made a grant of £5,500. The villagers who were to benefit by the college bound themselves to raise £500. In these ways the necessary money was raised, and in October 1930 the Sawston Village College was opened by the then Prince of Wales.[5]

Offer from Laura Spelman Foundation

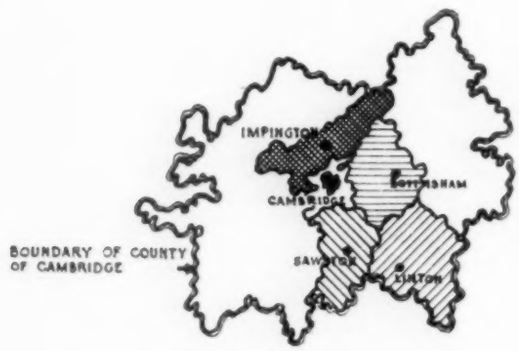
It was hoped—and expected—at the time that Sawston would quickly be followed by other colleges. A few months previously the Cambridgeshire Education Committee, greatly encouraged by the offer from the Laura Spelman Foundation to make the large

[1] English educationists were at that time developing the idea of a "central" school for older children, receiving pupils from the primary schools of a neighborhood.

[2] Now the Ministry of Education.
[3] Actually, it cost £21,000.
[4] It has now been altered by the Education Act, 1944.
[5] Later King Edward VIII, and now Duke of Windsor.

grant of $225,000, in order to assist the county council to demonstrate to the world a rural tract of country with a full complement of educational and cultural institutions, had approved a scheme to provide eleven colleges in the county area. But the world-wide economic depression nipped these plans in the bud. Owing to financial stringency, the Cambridgeshire County Council was unable to proceed with the proposed scheme, and the Spelman Foundation reluctantly withdrew the grant after some £1,500 had been spent on Sawston.

Seven years were to elapse before the second village college, at Bottisham, was opened. But this was quickly followed by Linton (1938) and, just as the second World War began, by Impington, the largest, best-known, and in many respects the finest and most complete—but, it is also important to remember, the youngest—of the village colleges.



MAP OF CAMBRIDGESHIRE
SHOWING FOUR RURAL AREAS SERVED BY FOUR VILLAGE COLLEGES.

SCALE OF MILES
0 1 2 3 4 5

Impington College

Without wishing to detract in any way from the magnificent work Impington has done during the war years, it must be pointed out that the architectural distinction of this college has given it a fame which has rather tended to overshadow that of the other colleges, and in particular that of Sawston, where the pioneering and experimental work was done which demonstrated the value and success of the village college idea. Impington, through no fault of its own, has not yet had the chance to function properly as a village college, for its opportunities have so far been drastically limited by wartime conditions.

Its architectural excellence, however, and its superb equipment single out its buildings for detailed description in an article which must of necessity be selective of detail. The college was designed by the celebrated architects Walter Gropius, now professor of architecture at Harvard University, and Maxwell Fry. Set well back from all roads on a magnificent twelve-acre site of tree-studded parkland, given by the Chivers family (the company's chief jam factory is sited in the village), it consists of three major parts: assembly hall, school wing, and adult wing.

Parts Function Independently or as Whole

These three parts have been most skilfully planned to enable them either to function quite independently or, when needed, as a unified whole. Direct access from one part to another is provided by a pleasant central promenade, 140 feet in overall length by 20 feet wide, which forms, as it were, the backbone of the design.

The commanding feature of the main elevation is the assembly hall, which is linked to the only two-storied building of the group. To the right of the hall is the main entrance, opening on to a large hall, and beyond that the adult wing with its long elevations facing northwest and southeast. The school wing is behind the hall and to the left of it. It is placed well to the rear, with its rooms facing southeast and looking out over the college grounds and the open fields beyond.

The construction of the buildings is in reinforced concrete, steel frame, and load-bearing brick walls. The external walls are 14 inches thick and are faced on the outside with a rough textured yellow brick, except that for the plinths, the chimney stacks, and the piers carrying the steel girders of the assembly hall dark brown bricks are used. On the internal walls light grey sand lime bricks pointed with cement have been used in the promenade and passageways, and in the science laboratory. In the classrooms of the school wing, the 14 feet high structural walls are covered with a dado of glazed tiles up to a height of 3 feet 6 inches, and above this are either plastered or of glass. In the adult wing, the walls of the games rooms are plastered; those in the lecture hall and common room are finished in plywood paneling.

The floors in the classrooms, library, lecture room, and promenade are of Granwood composition blocks; in the corridors, and cloakrooms of tiles or granolithic. Underfloor heating is used in the adult and school wings and in the two-story section. Most of the ceilings are of wallboard, butt-jointed and with chamferred edges, giving a paneled effect. All window frames are steel. The classrooms in the school wing are designed on the "open-air" principle with the southeast wall consisting of glazed folding windows from floor to ceiling and giving a 50 per cent opening. The opposite wall is of glass above dado height, and the access side consists of an open corridor.

All the rooms in the college, including the classrooms in the school wing, are equipped and furnished for specialized purposes, and every attempt has been made to create a bright and cheerful atmosphere. To add to the effect of ample natural lighting, the interior decoration has been carried out in light shades of distemper with bright contrasting colors sparingly

used in carefully selected positions. The furniture throughout is distinguished by simplicity of line, use of color, and attention to function. In the classrooms, tables and chairs largely replace the old-time desks; in the adult wing the craving of the adult for armchairs is fully recognized. Light woods are used, with good upholstery in chestnut red and other warm shades.

Ample cupboard space is provided in all teaching rooms; in some cases the side wall has a continuous cupboard below the window, in addition to cupboards beneath the wall blackboard. The cupboards in the handicraft rooms have been carefully detailed to take the various tools, and in the domestic sciences room the cookers have been placed so that a class may be grouped round them for demonstration purposes.

The library has an apsidal end, with nearly continuous clerestory windows over the bookshelves, an arrangement which is both practical in use and effective in appearance.

Uses of the Assembly Hall

The assembly hall, which seats 320 people, has a good stage, with dressing rooms at the rear, and a cinema projection room. The stage is well equipped with three-color lighting, switch-gear, and curtains—all, incidentally, made by the adults who use the college. The hall serves many purposes: during the daytime it is the school assembly hall and gymnasium; at night it is used as need be as theater, concert hall, cinema, dance hall, lecture room, or for public meetings.

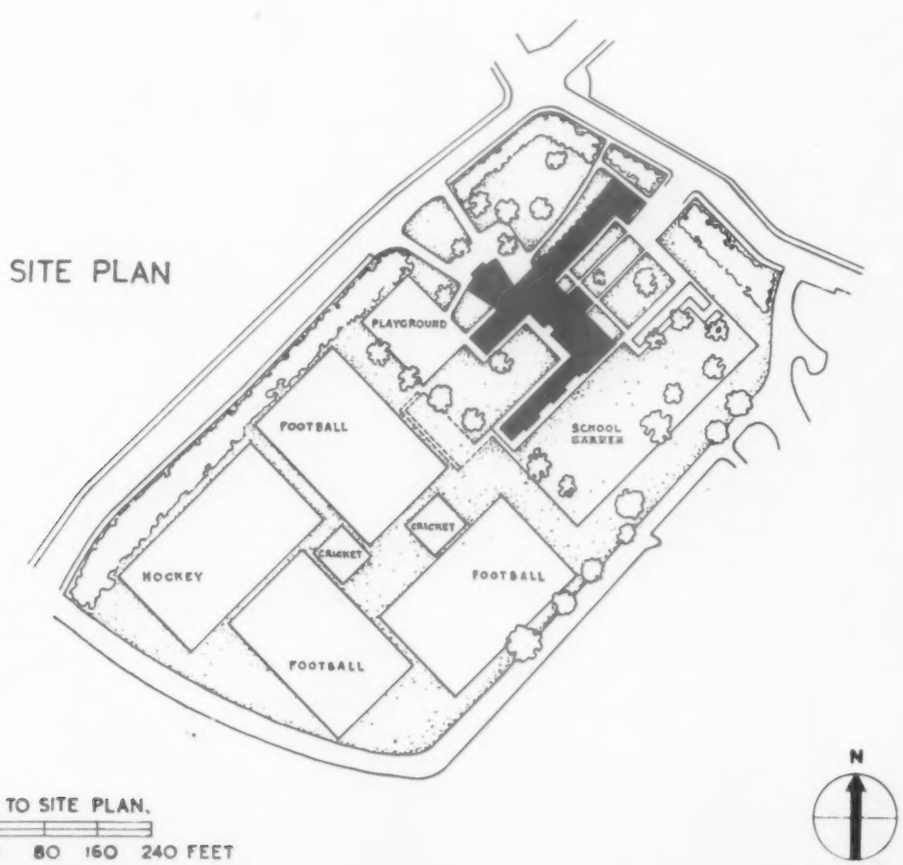
Activities Fit Many Tastes

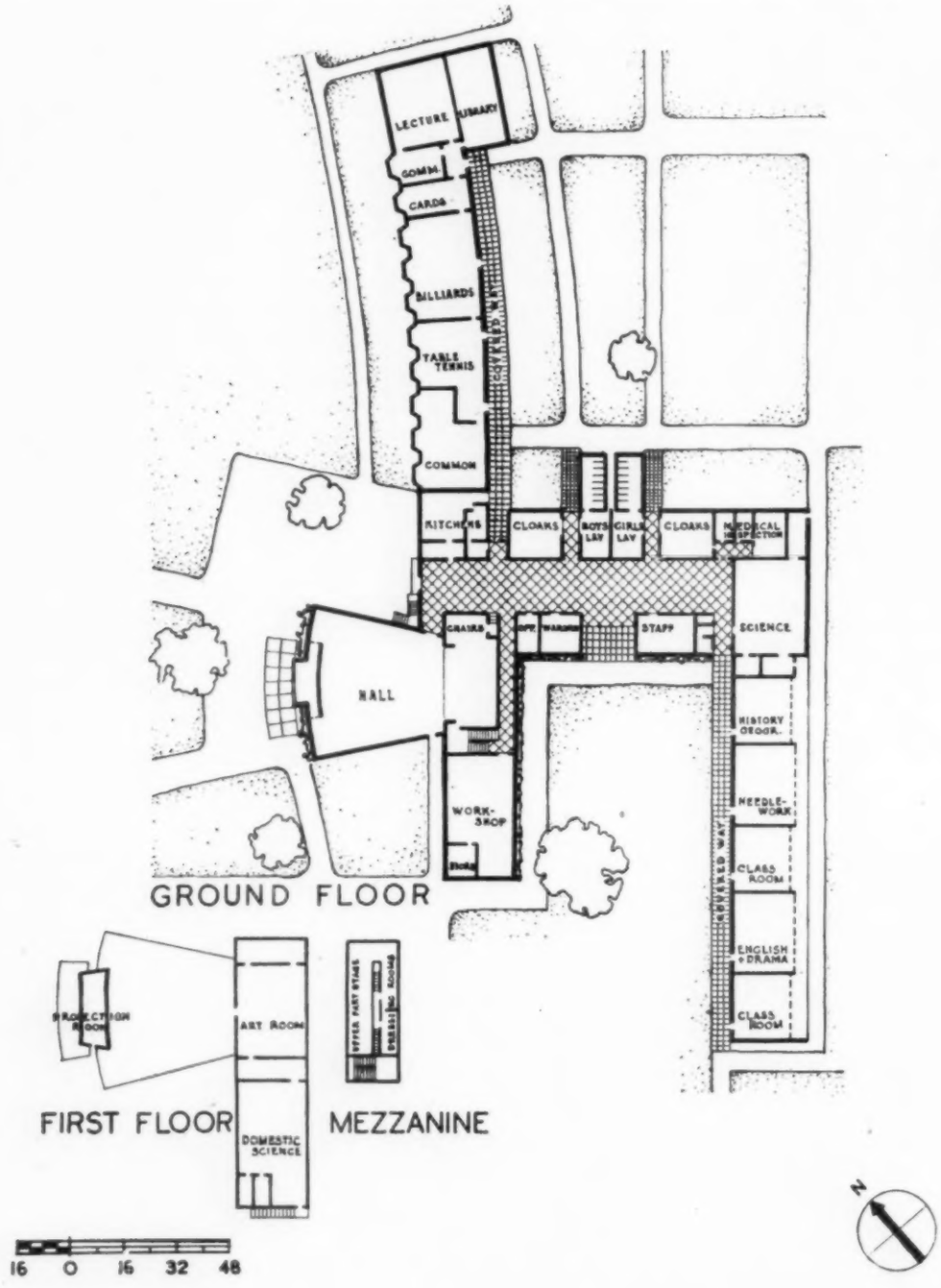
This multiplicity of uses has its disadvantages, but it does at least suggest that the place is well used. This is true of all the accommodations at Impington and indeed at all the colleges. Despite the fact that only Sawston had a clear run of some years in normal peacetime conditions, there is already ample evidence that the colleges meet real needs in satisfying ways. The numbers using them are the first proof; at Impington, which serves a population of 7,500, about 1,000 people a week take part in the college activities. What is perhaps most encouraging is that nearly seventy per cent of the boys and girls, on leaving the secondary school, come back in the evenings.

The youth and adult activities are numerous, varied, and vigorous at all the colleges. As befits educational establishments in rural areas, there are strong agricultural and horticultural societies, with "Young Farmers' Clubs"—branches of a national organization—for the boys and girls between the ages of fourteen and twenty. But the dramatic societies, the music and gramophone clubs, and the choirs have equally large and enthusiastic memberships. One of the greatest surprises in the development of the colleges has been the popularity of music, both instrumental and choral, and the amazingly high standards of performance achieved. To give but two instances of the

Impington Village College

"Set well back from all roads on a magnificent twelve-acre site of tree-studded parkland"





Impington Village College

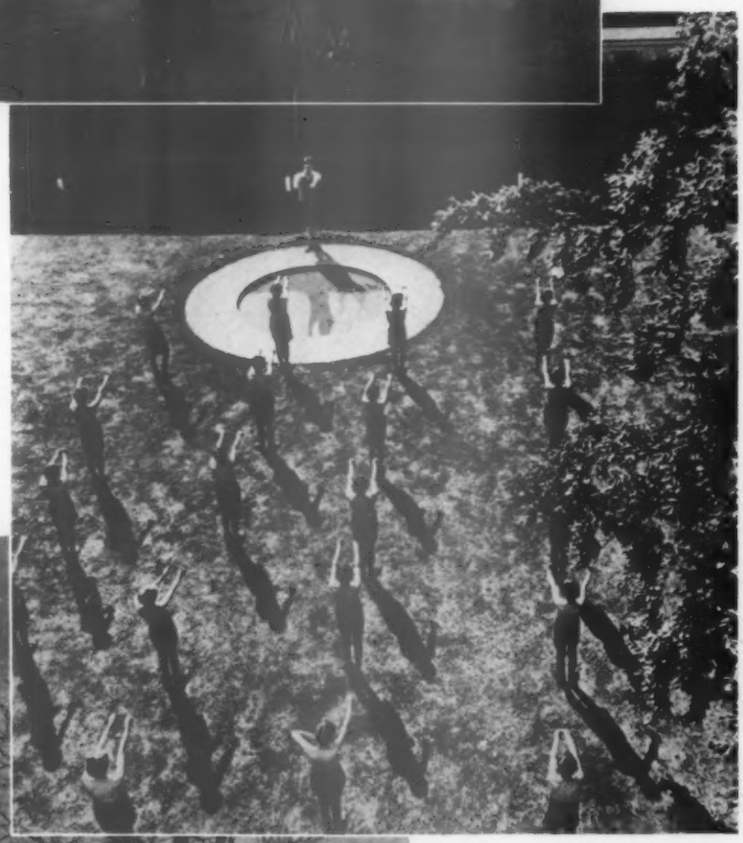
"three major parts: assembly hall, school wing, and adult wing . . . function quite independently or, when needed, as a unified whole. Direct access from one part to another is provided by a pleasant central promenade"

quality of the interest shown, a group at Impington is this winter attending a course of eighteen lectures covering the works of (among others) Sibelius, Holst, Bax, Delius, and Elgar, while Sawston is presenting a series of six celebrity concerts. Every college each year produces several first-rate concerts and theatrical performances.

For the housewife there are courses in cookery, dressmaking, needlework, and "make-do-and-mend"—that enforcedly popular British wartime pursuit. The craftsman or craftswoman has a wide choice: woodwork, including furniture making, metalwork, leatherwork, including glove making, plastics, toymaking, and the ancient rural craft of thatching are among those offered this year. Physical education, both practical and theoretical, is available for girls, boys, men and women, while those to whom dancing appeals can have their choice of folk country, old-time, or modern ballroom.

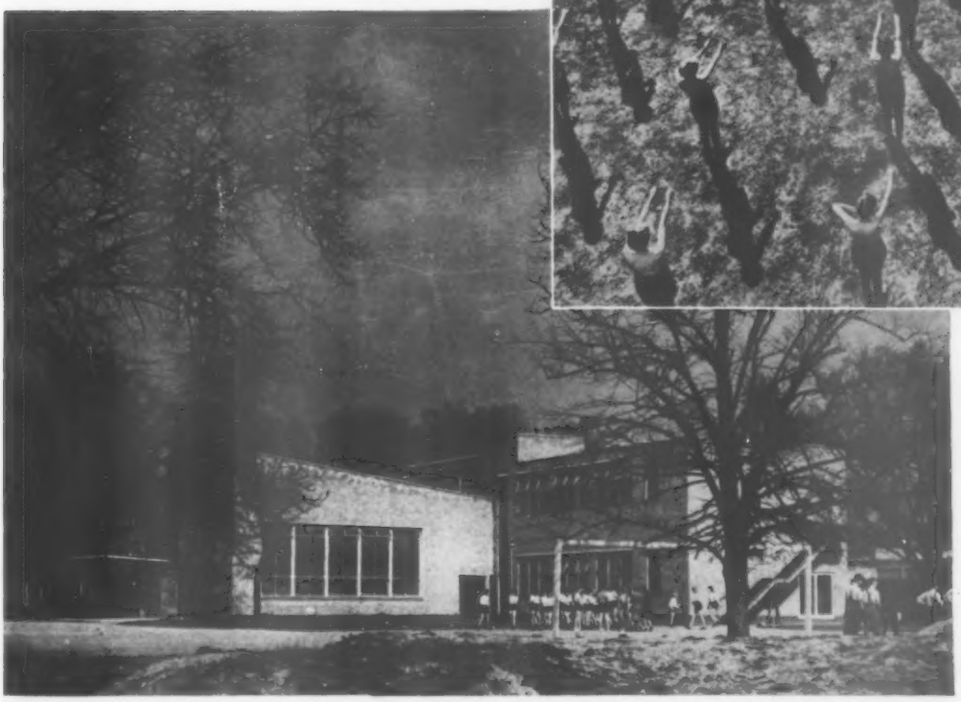
For the highbrow there are lecture courses arranged by the Cambridge University Extra-Mural Department or the Workers' Educational Association. This





Physical education, "theoretical and practical," at Impington College (top to bottom): dancing instruction in the auditorium-gymnasium; physical training on the college grounds; girl's gymnasium class assembling for a lesson in the open

Pictorial Press, London



year groups are studying, at Impington, "The Story of East Anglia," and "The Society and Literature of this Century"; at Sawston, "English Local Government"; at Bottisham, "Political Thought and Institutions in the World To-day"; at Linton, "The Facts of Fiction." Opportunities are given at all the colleges for discussion groups on current affairs, for the learning of foreign languages, and for classes in vocational subjects.

Primarily Community Centers

But participation in formal education is not a condition of use of a college. While in a very real sense the Cambridgeshire village colleges are universities in the medieval sense of *studia generalia*, they are primarily community centers, places where the people of a neighborhood may join together in whatsoever cultural, social, and recreative activities atttract them: in short, to enjoy themselves in their self-selected groups and associations and to realize that diversity in unity which is the essence of community. The common rooms where they may sit and talk, and the canteens where they may do the same over a meal, are as essential and fundamental features of the colleges as the study and handicraft rooms.

So, too, are the committee rooms for the transaction of public affairs. Here meet the local statutory bodies —the parish and the rural district councils—and the executive and other committees of the local voluntary associations. Here, too, the business affairs of the colleges are discussed and administered.

Photo by Dell and Wainwright, courtesy of the Architectural Review



Colleges Are Self-Governing

One of the most interesting and valuable features of the colleges is their democratic system of government. Ultimate control, of course, lies with the Cambridgeshire County Council as the education authority. The council appoints for each college a Board of Managers which exercises executive control on behalf of the authority. This board is made up of one representative of each village in the college region, one representative of each parish council, and one or more representatives of the students' council.

The students' council is elected by the students' association, which anyone attending the college may join for the nominal fee of 6d. (10¢) a year. There is no "membership" of a college in the ordinary sense of the term; the colleges are open to all. The council which is representative of every established group or class in the college, is technically a purely advisory body, but in fact has a major say in the management of its day to day life. The constitution of the Impington Students' Council, for example, sets out the objects of the council as:

1. To make suggestions for classes and other activities, and to aid in the organization and carrying out of the college program.
2. To arrange social functions, and in all ways to foster the social life of the college.
3. To further generally the interests of students and of associations using the college.

The college council functions largely through committees, each of which is charged with oversight of a particular department—e.g. library, canteen, social functions, youth clubs—and has power to raise and administer funds within its terms of reference. Such funds are often considerable, for the colleges charge for a wide range of their services. Lecture courses and educational classes have to be paid for, if only at nominal rates. Clubs and societies charge a member-



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Photo by Dell and Wainwright
Courtesy of the Architectural Review

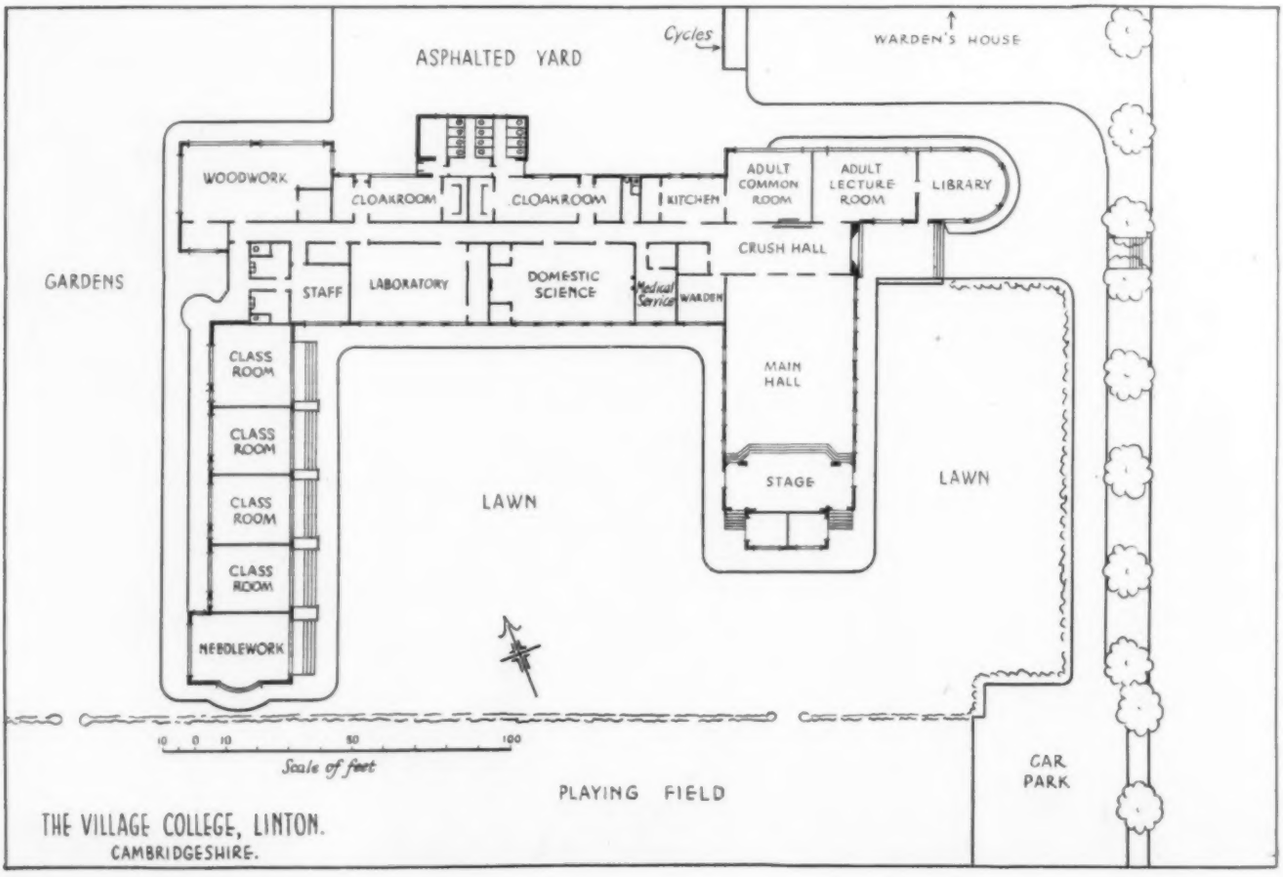
Top to bottom: Impington College, view from the roof of the entrance to one of the classroom wings; the domestic science center; a meeting of the college board of governors

Page facing: Impington College, view from the west, showing the assembly hall with its canopied entrance and the two-storey block containing work shop, art room, and domestic science center



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General view of some of the classrooms at Impington College. Glazed folding windows provide a fifty per cent opening



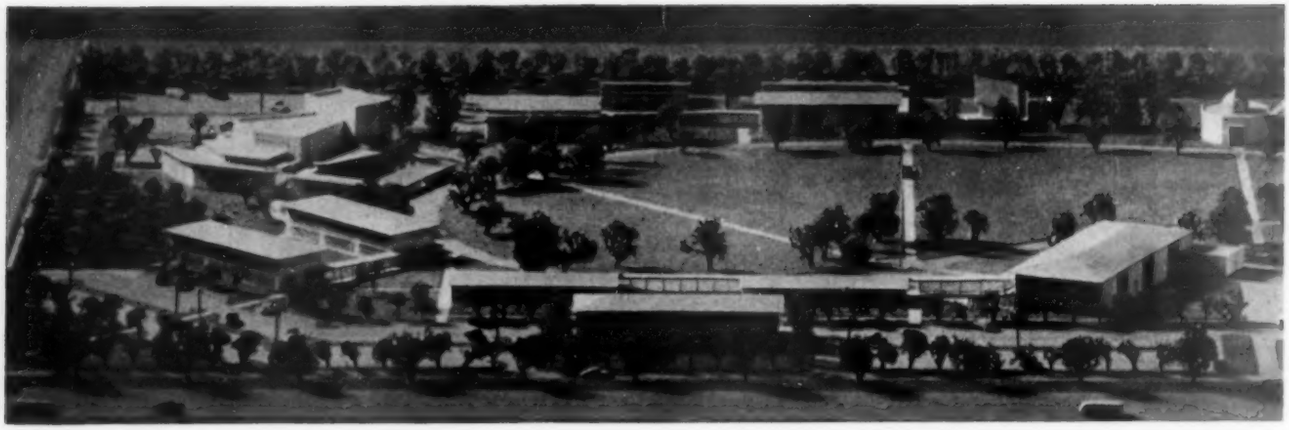
ship fee. Concerts and plays are not free. Committee rooms have to be hired, as has also the assembly hall. All this is done deliberately to prevent there being any atmosphere of charity, and to give all those who use the college an added sense of possession. The funds thus accumulated are used to improve the amenities of the colleges. One important item of expenditure is for special evening bus services to and from the college and the outlying villages of its region.

Professional Paid Staff at Minimum

A most important result of the system of self-government and the spirit of self-help developed in the colleges is that the number of professional paid staff is kept at a minimum. The day school is, of course, staffed throughout by qualified teachers, who are in the employ of the county council; but the only paid staff for the evening work are the warden of the college, the adult organizer, the youth organizer, and the caretaker. All the clubs and associations, the canteen, the library service, the concerts, stage plays, discussion groups, and so on, are run by voluntary effort.

Now that the war is over, all the colleges are looking forward to a great expansion and enrichment of their work. "It has been a remarkable feature of the village colleges," writes the Warden of Bottisham in the 1945-46 prospectus, "that in spite of all the difficulties of wartime—lack of transport, shortage of staff, and above all the absence of so many of our young people—there has been a steady development and expansion of their activities and influence. With a gradual return to more normal conditions we should now begin to gather the harvest of these years of experimental development. Our new opportunities are a challenge to staff and students alike, and . . . anything that will enrich the social life of our rural communities is included in our province."

It should be added that the Cambridgeshire Education Committee has at the moment under consideration a scheme for raising the number of the colleges to twelve, at an estimated cost of about £250,000.



THE JUNIOR COLLEGE PLANT

By CECIL D. HARDESTY

Superintendent of Schools, Montebello Unified School District, Montebello, California

THE purpose to be fulfilled by a junior college should provide the blueprint for developing the junior college plant. In the academic field, the school plant conditions the program; in the vocational field, the school plant controls the program. The educational plans for the school should dictate the building plans.

The first step therefore, in planning a junior college plant is to determine the function of the school. Is it a community college? In most cases the answer is "yes." Is the purpose of the school to provide vocational education primarily of a terminal nature for recent high school graduates? In most cases the answer should be heavily on the "yes" side. To what extent is the school a preparatory school for upper division of the university? The answer to this is conditioned by the nature of the community, the geographical relationship to institutions of higher learning, transportation, and many other factors.

The junior college is not a high school. It is a school for mature young men and women of post high school age, and should provide also for the educational needs of older adults of the community. The junior college plant should be planned to meet these specific needs.

Planning a junior college plant is hard, tedious work. Asking an architect to "present a plan" is an easy "out"; and an almost sure way of getting a wrong answer unless the architect is a three-in-one architect, educator, and community planner.

Planning the junior college plant calls for translation of broad statements of purposes and estimates on enrollments into definite curricular offerings and specific classroom needs.

It is impossible for one article to cover all of the ramifications of planning a junior college. This article will cover such topics as the site, the architect, and the master plan; and will discuss some specific junior college plans, as well as the utilization of high school facilities by a junior college.

The Site

A study [1] of junior college sites in California, where state support financially has combined with other factors to cause junior colleges to develop generally, found sites ranging from two and a half to sixty-five acres. Junior college administrators of the state felt in the main at the time of the study that a well-planned plant could be placed on a thirty-acre site. Obviously the size of the school and the area devoted to athletic fields, stadium, and parking are important factors in determining the minimum size site for a particular school.

Dr. Charles Bursch, for several years chief of the Division of School House Planning, State Department of Education of California, has stated that forty acres represents a desirable minimum for planning a junior college site.

Location of a junior college site adjoining a park in a quiet residential area is a desirable arrangement. Selection of a new site must take into consideration the residence location of students. Location near the student population center is a desirable feature of a school site but one that frequently has to be compromised because of cost or other factors.

Access to the junior college site by both highway and car line or bus are necessary.

Natural drainage of the soil is desirable for a junior college site. A fertile sandy loam soil which is non-alkaline, non-erosive, quick drying and free from decaying organic matter is desirable. A rolling site should be studied carefully before being purchased

[1] *Problems and Practices in Housing the Junior-College Program in California*, University of Southern California Press, Los Angeles, California.

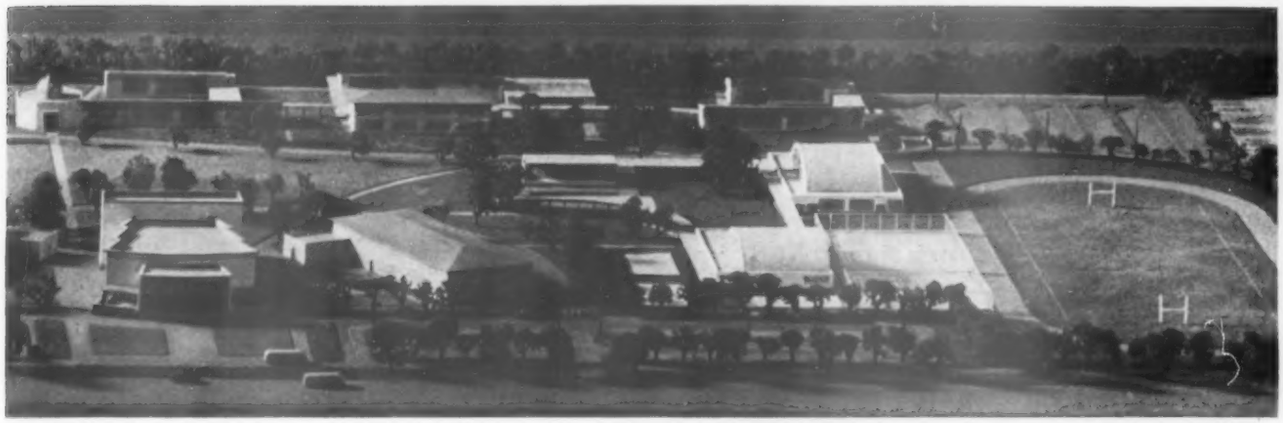


Illustration 1 (above and page facing). Model, Santa Ana Junior College. Illustration 2 (below). Same model (from a different angle)

but may lend itself to advantageous plans for buildings, athletic field, and stadium.

The Architect

Selection of the architect is important. The architect should be selected on the basis of his experience and demonstrated ability in planning school plants. School architectural work is specialized.

The architect should be a man who understands community needs and will not only fit the school to the community in appearance but also be helpful in developing the community through the plans for the school.

Since the junior college is a specialized community school, an architect who has had experience in developing modern high school and elementary school plants is more apt to grasp the junior college building problems than an architect whose only school experience has been at the university level.

At the time the architect's contract is made, agreement should be reached on who will do the structural and mechanical engineering. In many cases these services are performed by men in the architect's firm. In other cases the architect sublets the engineering. The school superintendent and board of education should select engineers at the time of selecting the architect.

Models to Scale

A practice which has gained considerable favor in recent years both with architects and their clients is that of developing models on a miniature basis of the buildings proposed on a school site. Illustration 1 is a picture of a model of this sort. It was prepared by Ralph C. Flewelling and Associates, architects, of Los Angeles, for the proposed junior college at Santa Ana, California. Illustration 2 is a second photograph of the same model taken from a different angle.

Such a model gives the board of education, which is ordinarily a lay group, an actual understanding of the



final appearance of the plant that cannot be gained from blueprints.

The Master Plan

The first plan for the junior college should be the master plan involving the entire site and the location of all buildings and facilities that will ultimately be provided on the site.

It is not enough to buy a big site, and build the first building on the corner, leaving "room for later expansion." Long-range plans in minute detail should be made before the first building layout is sketched.

True enough that exact future needs and enrollments cannot be predicted. But truer by far that no master plan for a school can be made until many assumptions are accepted and estimates are made.

As conditions change through the years, the master plan may have to be revised, but the existence of such a plan improves chances for being able to make the buildings and site serve economically and effectively the needs of the community.

In developing the master plan, attention must be given to special facilities such as auditorium, swimming pool, tennis courts, handball courts, stadium, etc. Whether the community has adequate community facilities of this sort may determine whether any one of these items will have to be provided by the junior college and, if so, the size of the facility.

If the community has an adequate community auditorium, the junior college will need to provide auditorium facilities for junior college students only. On the other hand, if the community has no adequate auditorium, the junior college can provide for that community need. The same possibilities carry over into the other areas mentioned.

Planning for classroom needs is a difficult part of the master plan. In setting up a schedule of the housing needs for a particular school, it is essential to set up administrative policies in regard to:

1. The number of periods in the school day.
2. Number of periods each class will meet weekly.
3. Number of days school will be held weekly.
4. Dimensions of and arrangement of pupil stations in the various types of classrooms.
5. Class size by subject matter, and general practice to be followed in applying class size policy to specific enrollments.

The following steps represent a procedure [2] for developing specifically a statement of classroom needs for the school.

1. Estimate the peak school enrollment.
2. State curricular offering in terms of specific courses.
3. Set up standards for class size which are considered (a) minimum (b) desirable (c) maximum.
4. Estimate probable enrollment for each course.
5. Calculate the number of class sections per course.
6. Calculate the room periods per week per course.
7. Allocate the room periods per week for each course according to type of classroom.
8. Calculate the number of rooms of each type that are needed.

Once the master plan has been accepted, attention can be turned to the development of plans for in-

[2] *Op. cit.*

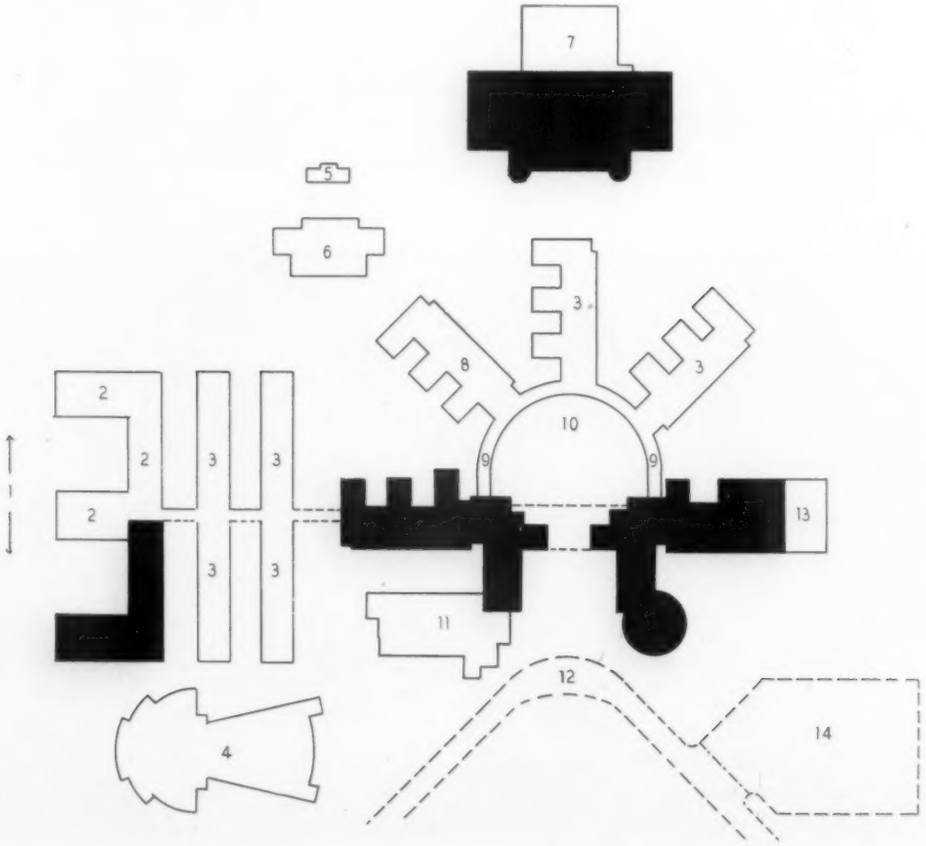


Figure 1. Visalia Junior College initial project

Legend:

1 Student parking
2 Future additions to shop
3 Future classrooms
4 Future auditorium
5 Custodian unit
6 Future cafeteria
7 Future girls' play floor
8 Future domestic science unit
9 Cement walk
10 Future arcade
11 Future library unit
12 Drive
13 Future addition
14 Future parking area

Note: Original buildings are filled in in black; future projects are outlined

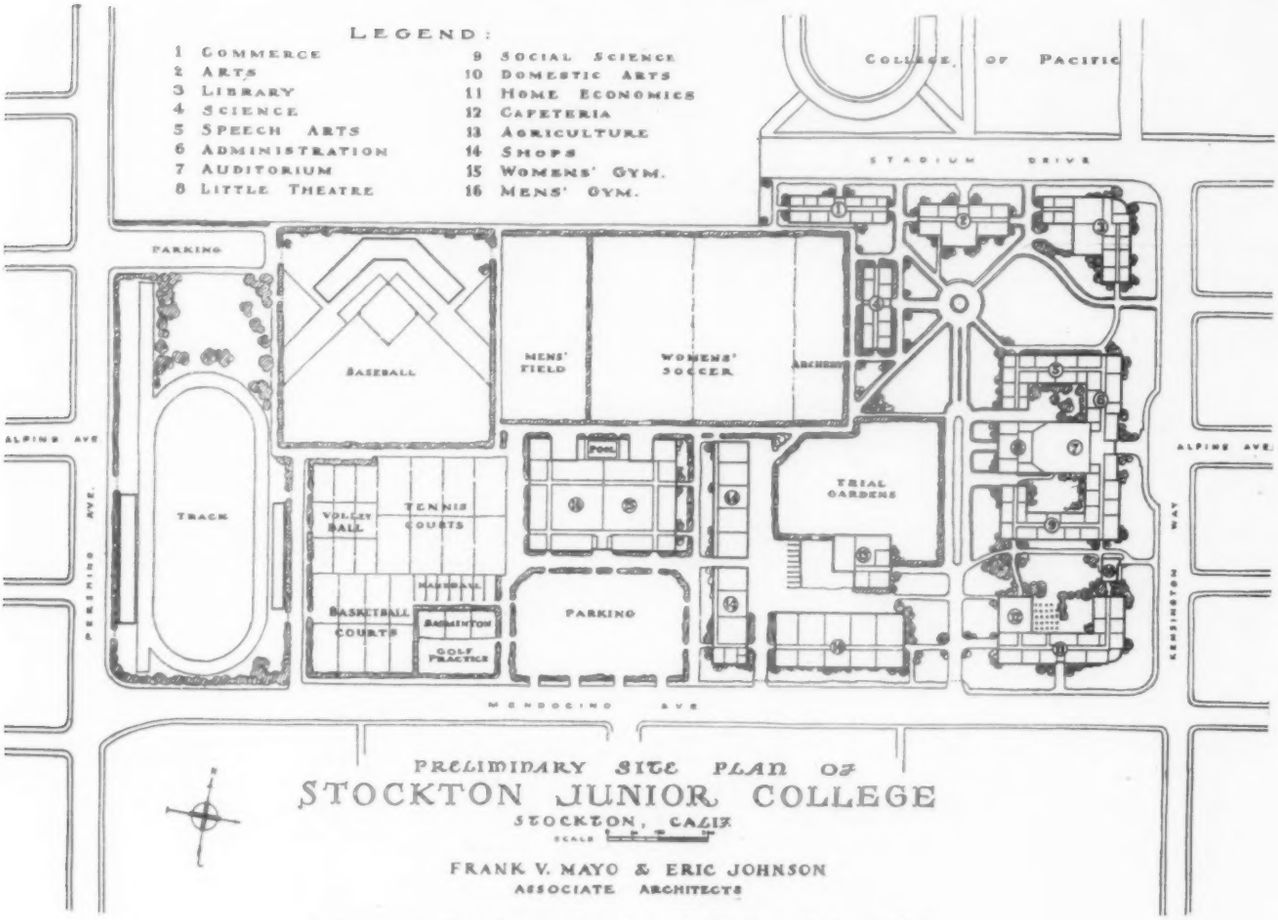


Figure 2. Preliminary site plan of Stockton Junior College

dividual buildings, units, and classrooms. The best schoolroom can be developed by the people who know most about what is to be done in the room and how to build a school plant. This ordinarily involves those who know the educational program—the classroom teacher, supervisors, the school principal, and the superintendent of schools, and the architect who understands the construction problem.

Two master plans for junior colleges are presented to show advantages of long-term planning.

The Visalia Junior College Plan

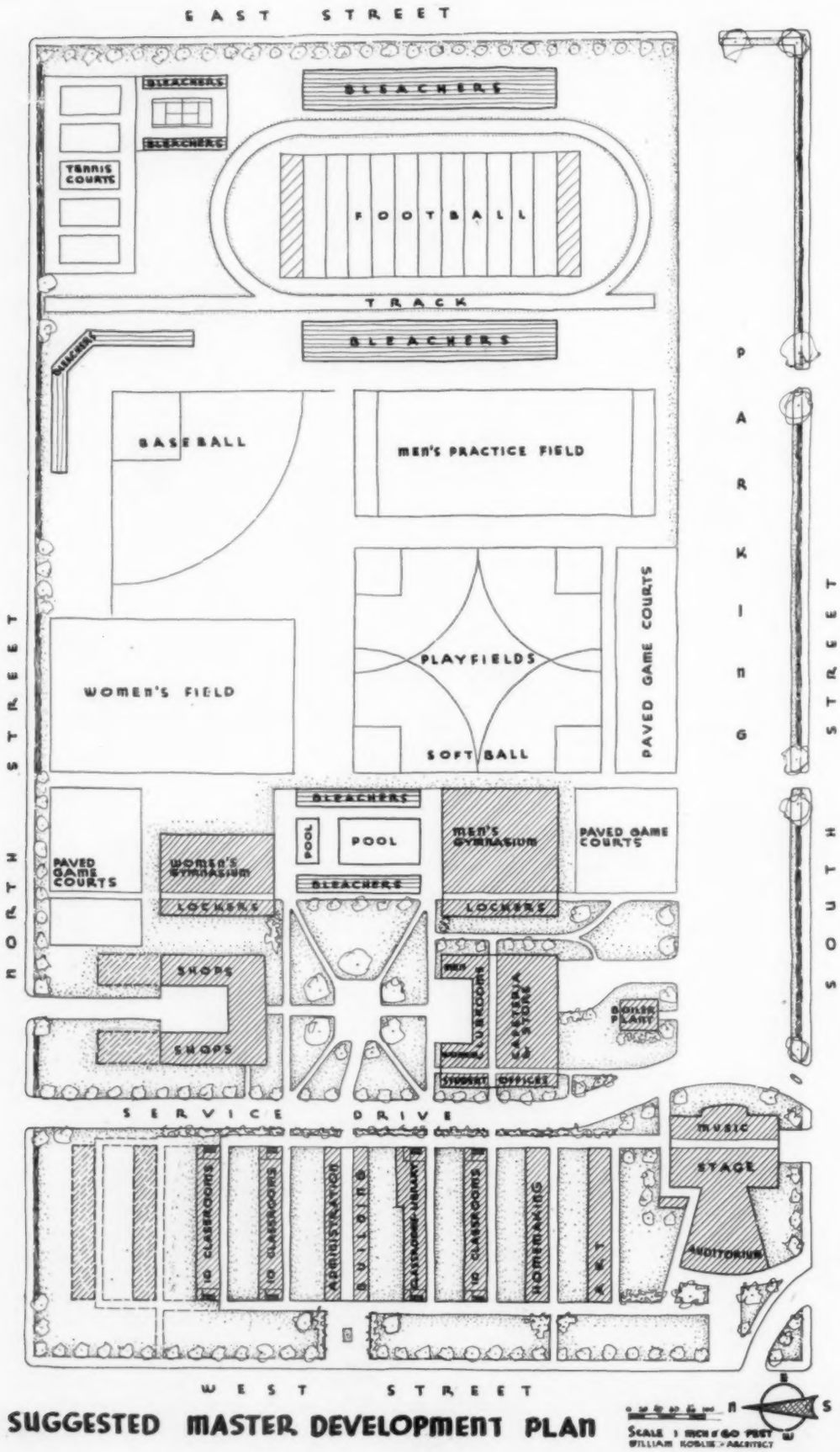
The Visalia Junior College master plan is shown in Figure 1. It departs from traditional practice in arrangement of buildings. The plan is good in terms of a long-range building program. Student traffic will be held to a minimum. Shops and gymnasiums and cafeteria are removed from the classroom areas. The public can enter the auditorium without having to go through the rest of the plant. If, as might be anticipated, there is a student center in connection with the cafeteria, where students may gather when not in class or library, that would be desirable. It would tend to keep students on the campus and away from the street and parking lot.

Study of the Visalia Junior College plan, showing the original buildings in their space relationship to future buildings, will demonstrate the wisdom of developing a complete master plan when the school is first planned.

The Stockton Junior College Plan

Figure 2 shows the plan for the proposed Stockton Junior College of Stockton, California. It will be noted that this plan is of a more conventional type than that of the Visalia Junior College. This is particularly true if attention is paid to buildings five, six, seven, eight, and nine. This group of buildings includes the administration building and the auditorium, two units which very frequently are the focal point for junior college activities. It will be noted that adequate provision has been made in the way of an athletic field and that the swimming pool adjoins both the men's and the women's gymnasiums. The shops separate the athletic program from the administrative unit and in turn are separated from the administrative building, for most classrooms will be bound by gardens, the agricultural building, and the cafeteria.

An interesting feature of the Stockton Junior College is the fact that it is located directly acros sthe street from the College of the Pacific. Originally this institution was operated as a five-year college. More recently the first two years of the program have been operated as the Stockton Junior College. The classes have been supervised by and administered by the



SUGGESTED MASTER DEVELOPMENT PLAN

A suggested master plan for a junior college, which has been developed by William Koblik, architect in the Division of School House Planning of the State Department of Education, California. A particular feature of this plan is the provision made for lighting of classrooms. The classroom buildings have been arranged so that all of them will have north lighting. This type of construction, with single classrooms in a row and open corridor on the side, is particularly good in areas that are favored with mild climate

Stockton Unified School District, but they have been held on the College of the Pacific grounds under a contract between the college and the public school district. It is understood that the stadium of the College of the Pacific will continue to be used by the junior college after the junior college site is complete.

Junior College Use of High School Facilities

It is doubtless true that, in a big majority of the instances in which a junior college is created, the need for education at that level is felt in the community and results first in the addition of some junior college work to the existing high school. Later, as the junior college comes to be accepted in the community and as the institution proves itself, attention is given to the securing of a separate plant for the junior college.

There are doubtless many communities in the country where the junior college will always be small. Where the number of students of the junior college age is such that there will never be a big junior college, the provision of complete facilities for use only by the junior college would be exorbitantly expensive. In most such cases, the junior college and the high school will probably always occupy some common facilities.

The plan of the Chaffey campus, Ontario, California, has been selected to show how a high school and junior college can use certain facilities in common to advantage. The Chaffey campus plan is shown in Figure 3. It will be noted that the facilities which are used in common are located through the center of the site in general with the junior college facilities on one side of this central area and the high school facilities on the other side. Specifically, the library, the auditorium, the art and homemaking buildings, the student union, the music building, and the athletic facilities are used in common by the two institutions.

It is interesting to note that in the administration of this particular school situation there is not only a division between the high school and the junior college, but there is also actually a division within the high school itself. Ninth- and tenth-year students are housed primarily in the high school south hall while eleventh- and twelfth-grade students are housed primarily in the high school north hall; the junior college classes are in the main, of course, held in the

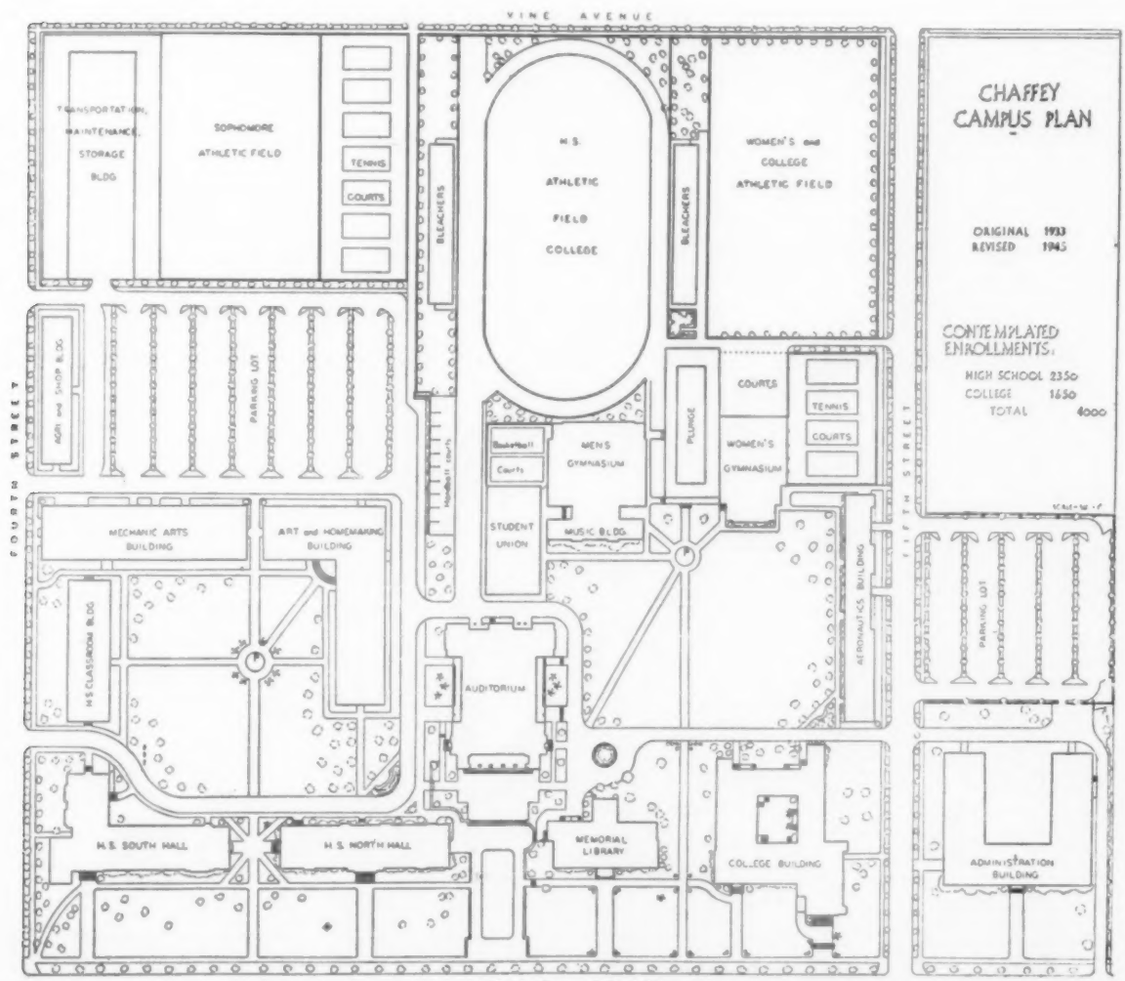
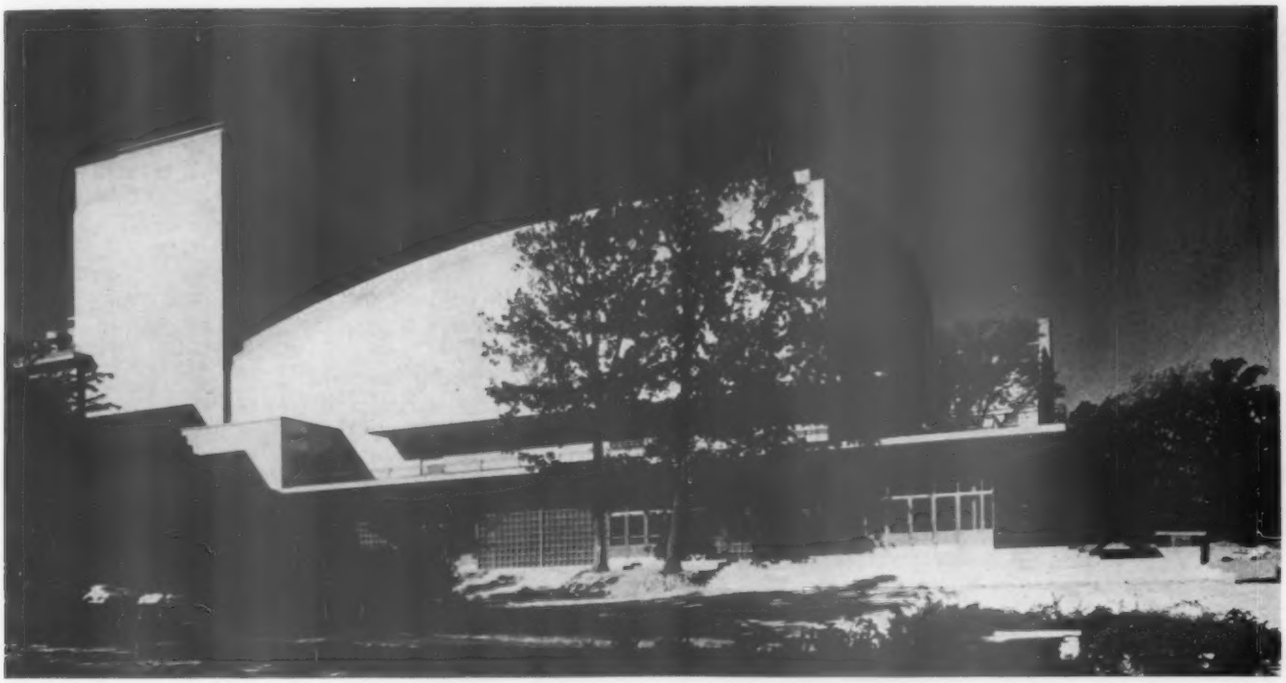


Figure 3. Chaffey campus plan

college buildings. Through architectural treatment, furnishing, and planting on the outside of the buildings, an attempt has been made to develop a different type of atmosphere for each building on the campus. While this is evident to a certain extent in the buildings that are devoted primarily to classes, it is particularly evident in the quiet studious atmosphere of the library building and in the country club type of atmosphere which is created in the swimming pool area.

Particular attention in this campus plan should be given to the location of the library at the center or near the center of the plant and to the location of a student union at a central point which, during the day, will find most of the students going by. In the administration of a junior college there will be periods during the day when individual students are not in class. It is highly desirable that there be a student building which provides a place where students are encouraged to spend leisure time. Such a building should have a snack bar or malt shop as one of its features. With this type of a center, it is possible to develop an atmosphere around the college which will tend to keep the students on the campus during the day.

Failure to make provision for meeting this need of junior college students will result in having the junior college students frequent off-campus eating places where, in the main, it is not as desirable for students to spend their leisure time as in a properly administered student union on the campus.



Wisconsin Union Theater, view from the lakeshore terrace

THE WISCONSIN UNION THEATER, UNIVERSITY OF WISCONSIN

General Plan and Arrangement

By PORTER BUTTS

Director, The Wisconsin Union; Planning and Educational Consultant, Association of College Unions

THE Wisconsin community theater project started with the assumption that formal education, recreation, and cultural expression are inevitably and deservedly interlocked in every scheme of civilized living. It was considered important that the arts should not exist in specialized isolation as so often occurs—a separate theater for drama only, a tomb-like art gallery open only at certain hours, a remote workshop—but rather that they should be associated with the vitalizing daily social life of the campus community and thus establish a creative and recreative center that would be alive from top to bottom almost every hour of the day and evening.

Cultural and Social Facilities Are Combined

The theater was built therefore as an integral part of the campus social and recreation center, the Union building. Brought together under the single roof of the Union, the theater and shops of the cultural center and the lounges, dining rooms, cloakrooms, meeting rooms, etc., of the social center supplement and fortify each other—with obvious economies in building cost and administration and with enormous convenience and satisfaction to student and faculty participants.

A theater plant was seen as one of the primary needs in a cultural program, but it was envisioned not as just a theater for drama a few hours each week, which is extravagantly expensive, but as an all-purpose community center capable of constant and multiple use and readily available to all organizations and individuals on the campus, so that they as well as the specialists might gain strength through cultural and creative activity.

Four Auditoriums in One

The size of the Wisconsin auditorium (1300) was determined as a result of studies made by the planning committee, which showed on the one hand the various types and number of performances that might be expected and on the other hand the size of the audience which each type of performance might be expected to attract. It was found that 248 performances a year at Wisconsin averaged less than 1300 in attendance and only twelve more than 1300. Many

audiences averaged 300-500, others 700-1000, and still others more than 1000.

This resulted in the necessity of having a flexible seating capacity. By drawing a dividing curtain under the lip of the balcony and placing no seats on the forestage, the capacity of the auditorium can be reduced to 425. If the curtain under the lip of the balcony is opened the total capacity is 688. If the fore part of the balcony itself is opened, the auditorium seats 976, and if the balcony curtain is opened, the house is at full capacity, 1300. Thus the auditorium may almost be said to be four auditoriums of different sizes.

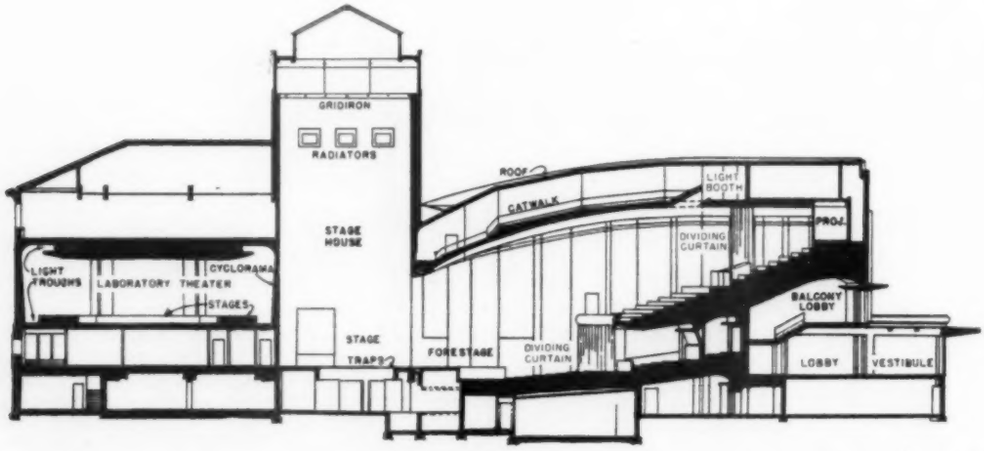
The theater is so arranged and equipped that it can be used not only for dramatic performances, both student and professional, but also for concerts (including the full university orchestra or band), lectures and forums, motion pictures, dance recitals, pageantry, and large meetings and conventions, adjoining galleries serving as exhibition spaces in the case of university scientific conventions and demonstrations. The theater is air-conditioned, making it possible to present programs the year around with comfort to the audience.

At the rear of the main floor are two glass enclosed observation rooms with unique functions. In the first instance they comprise part of the seating of the auditorium and in the second place their arrangement permits their use by student groups for study and discussion of performances in progress without irritation to the remainder of the audience. This is an important educational feature of the theater, making it possible for students to study actual drama and music performances under guidance as an art group studies actual paintings in an exhibition. The double glazed windows are rolled down when seats are used for ordinary purposes, and rolled up, with the performances heard through loudspeakers, when in use by study groups.

A smaller room, also being soundproof, is used as a radio pickup room for broadcasting stage programs, without interfering with the audiences' enjoyment of the performance; also, for control of all stage lighting from the front of the house, using a portable "extended control" switchboard.

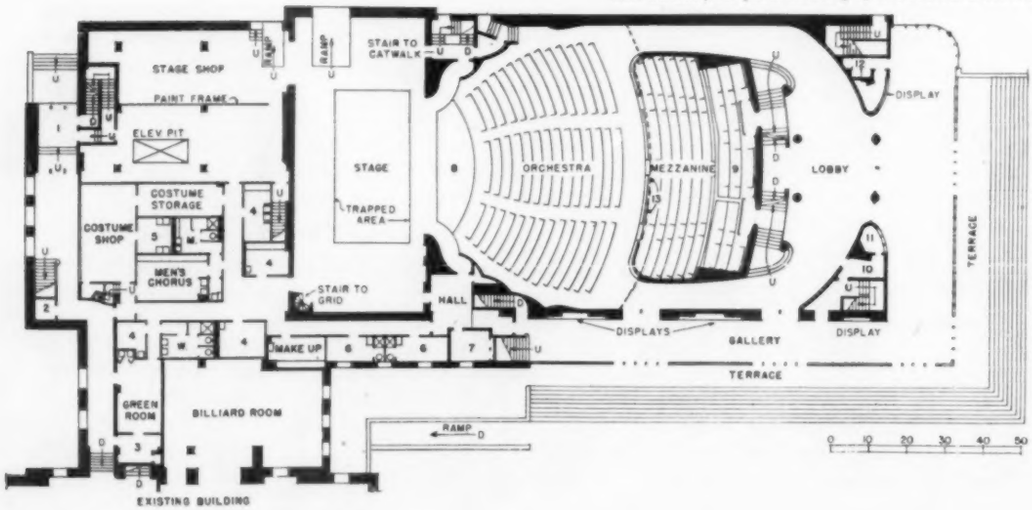
Stage Lends Itself to Varied Uses

The prime requirement for any stage is ample space. The depth of the Wisconsin stage is 35 feet, a minimum requirement. Total width of the stage is 78 feet. Blank, unencumbered walls provide space for the stacking of sets. The gridiron in the ceiling of the



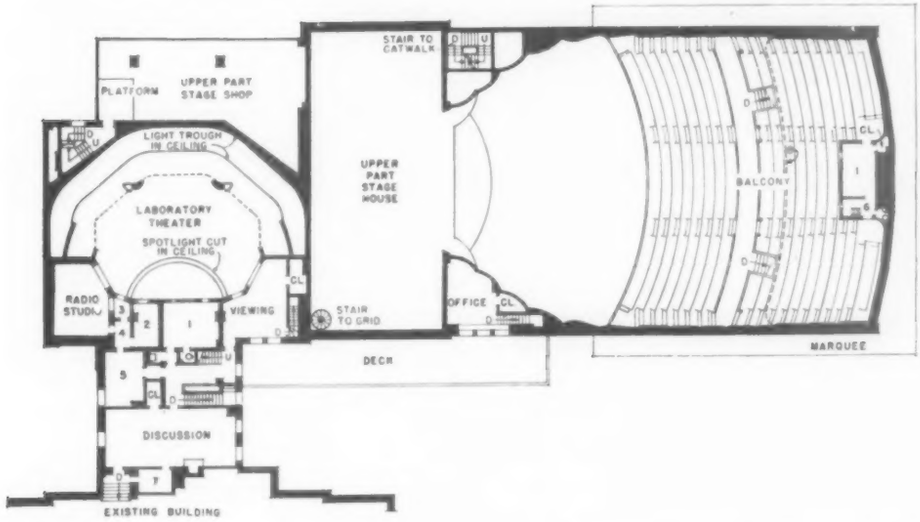
Section of Wisconsin Union Theater. Note dividing curtains; the observation rooms at the rear of the main floor

Section and floor plans courtesy of Architectural Record



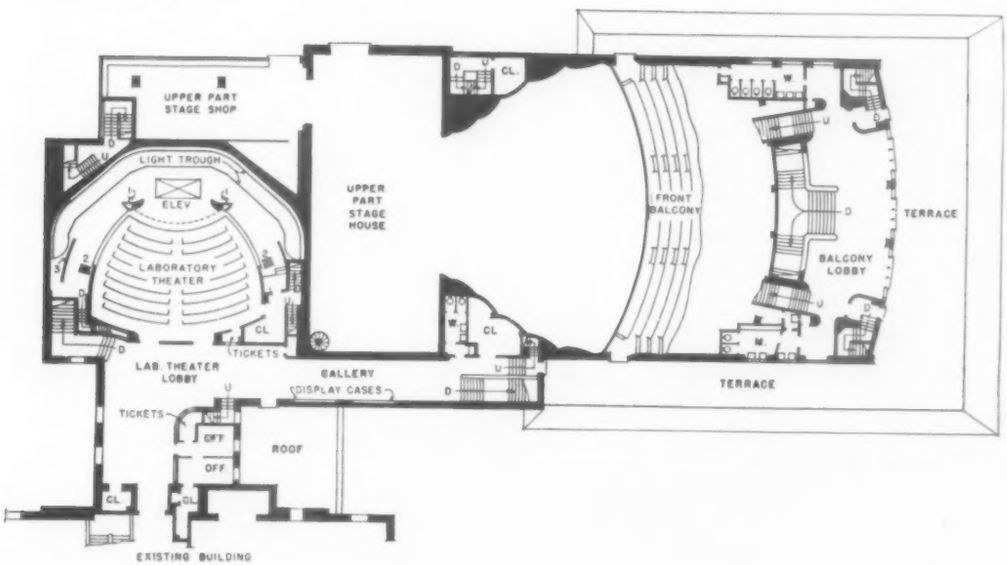
Ground floor of Wisconsin Union Theater

Legend:
1 Vestibule
2 Closet
3 Kitchen
4 Dressing rooms
5 Dyeing room
6 Stars' dressing rooms
7 Office
8 Elevator forestage
9 Loges of viewing rooms
10 Manager
11 Tickets
12 Telephones
13 Dividing curtain



Second floor, Wisconsin Union Theater

1 Projection room
2 Radio control room
3, 4 Radio directors' rooms
5 Quiet room (radio auditioning)
6 Movie rewind room
7 Kitchenette
8 Dividing curtain



First floor, Wisconsin Union Theater

Legend:
1 Tormenter lights
2 Folding proscenium doors
3 Sound baffle

stage house is 70 feet above the stage floor. Such a stage will accommodate traveling road companies, giving the university the opportunity to enrich the student drama program with examples of the best work done on the professional stage.

Additional flexibility is given the stage by a forestage working on an electric elevator, which permits it to be held at any desired level. The forestage may be used as an orchestra pit; as additional floor space for auditorium seats; as a lecture platform; as a small stage for soloists; and as an extension of the main stage for full orchestra concerts or pageantry.

Stage entrances are provided at both sides in front of the proscenium as well as behind the act curtain—for the convenience of lecturers and conductors, for pageantry effects, and to associate the actors more intimately with the audience in the non-picture-frame type of production.

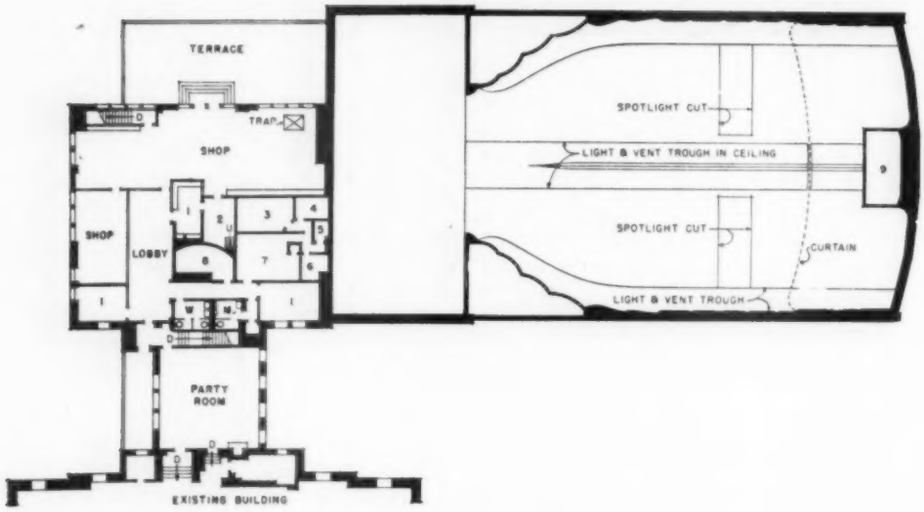
Shops Produce Sets and Costumes

Shops are a vitally important unit in any university or community theater if drama is to be utilized to the maximum as a creative enterprise. The shops at Wisconsin provide machine and hand tools for the building of sets, all manner of lighting and sound equipment, gas and compressed air lines, prop rooms, and space for painting scenery. The shops are provided with diffused light through glass block walls. The ceiling height is determined by the height of scenery to be painted.

Provision is made for the making of costumes, not only because costumes are often not otherwise available, but also because the art of costume design is in itself a factor in educating students in play production. Sewing machines, ironing boards, large layout tables, a small fitting room, a dyeing room, and costume storage space are part of the costume shop unit.

Laboratory Theater Fosters Experimentation

In addition to the large theater it was felt essential to have a small intimate theater of maximum flexibility. In the conventional theater plan, the audience views the performance only through the proscenium opening. It has meant that every performance is seen



Top floor, Wisconsin Union Theater

Legend:
1 Office
2 Craft storage
3 Photo enlarging
4 Contact printing
5 Film loading
6 Negative room
7 Photo workroom
8 Laboratory theater light booth
9 Projection room

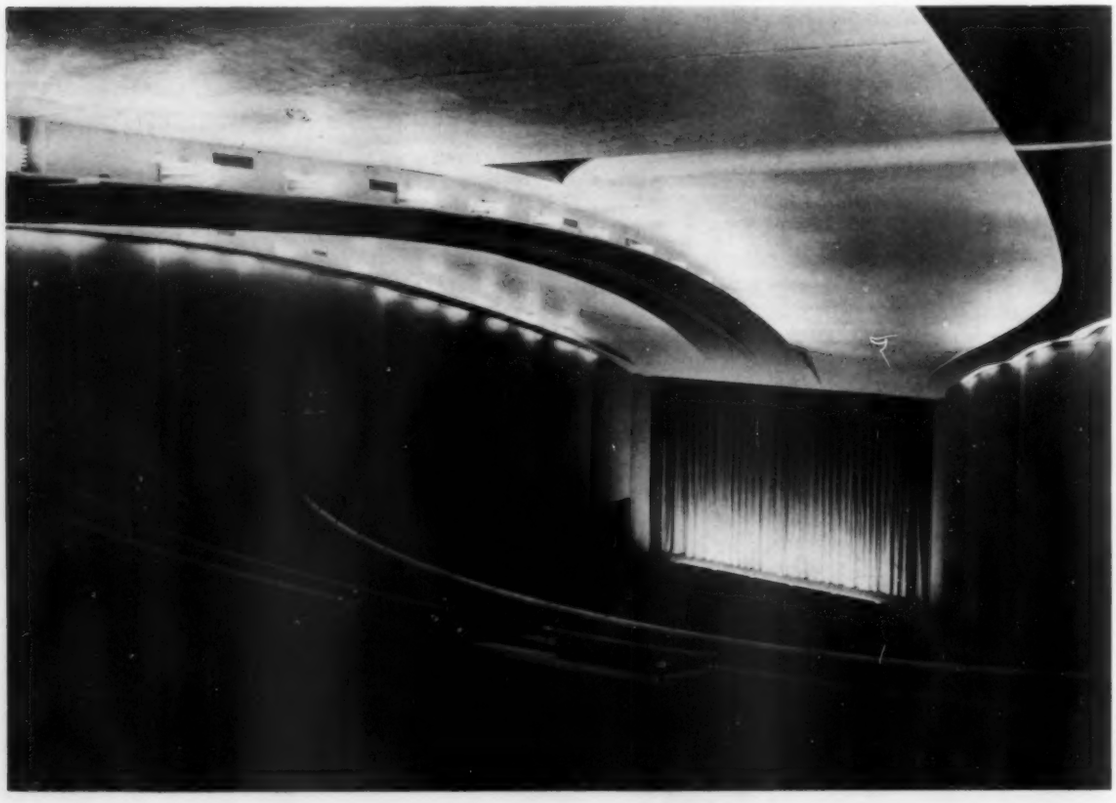
Interior of the main theater (below)

through a picture frame and is therefore considered inevitably as a picture.

Here there is an attempt to develop a type of stage which will not only permit the conventional production through the proscenium and the classic production on the forestage, but also permit productions in which actors surround the audience. Sliding wall panels on two side stages may be removed singly or in groups, so that the stage area may either be the conventional shape or it may half-encircle the auditorium, or it may be divided into a number of small stages.

The space is so disposed that the audience is in much more intimate contact with the players; they no longer feel they are simply watching a spectacle. With all movable partitions open the stage can be used for informal realistic productions, where the action is not concentrated at any one point but where instead the actors move freely and informally around the audience in much the same way that they might if the spectators were sitting at a street cafe.

Such a stage permits greater facility in giving productions where more than one scene is enacted at a time. The central action can take place within the proscenium; secondary action, such as is sometimes used in the plays by O'Neill, may be seen through openings at the side. Rapidly moving episodic plays



may be staged without scenery-shifting pauses, by blackouts from one stage opening to another. Provision is also made for the removal of the first third of the seats, so that actors may actually come out into the auditorium.

The object of the laboratory theater, aside from its function as a small lecture hall or discussion room, is entirely experimental and therefore the size is small (175 seats), as is also the stage. The stage, since it is not used by touring road companies, has no provision for a fly gallery.

Wisconsin's small theater also serves admirably for forums, chamber music recitals, 16 and 35 millimeter motion picture films, and radio drama. It is interrelated closely with the radio studios on the mezzanine and serves as the main broadcasting studio. Direction for radio drama is given through the soundproof glass of the control room overlooking the stage.

Radio Studio Includes Listening Room, Lounge

Complete radio control equipment interconnected with the university station makes it possible to originate from the building broadcasts of the many types of music, drama, or lecture programs occurring in either theater.

A "listening room" is provided for reception and auditioning purposes. It has a window giving on to an adjacent small lounge for those occasions when fireside or arm chair broadcasts are held in that room. When not in use for broadcasting, both the studio and listening rooms are used for line rehearsals, piano practice, or phonograph record playing.

Other Facilities: Rooms Serve Double Purpose

In a university theater, performances are a social occasion as well as entertainment; therefore ample promenade space is provided where audiences may smoke and discuss the performance. The promenade space has been developed as a gallery for art exhibitions, which may be seen during intermission as well as when the theater is not in use.

Two rehearsal rooms, with areas the same as the effective acting space of the main stage, make it possible to keep several productions in rehearsal at the same time, which is a typical need on the college campus. They are double purpose rooms, serving for music practice and for group meetings when not needed for rehearsals. The rooms are panelled with acoustical material so placed as to reproduce as closely as possible sound conditions on the stage.

The Green Room is another double purpose room, serving as a large dressing room when needed or as a small lounge and reception room for the actors. When not in use as a dressing room, make-up cabinets and lavatories are concealed by movable wall panels. A kitchenette adjoins, making refreshments between acts or for after-theater receptions readily available. The room is provided with a stock of theatrical books and magazines, and autographed photos of visiting performers line the walls.

Even the main theater lounge is a double purpose room. It is used in the first instance as a lounge for theater patrons between the acts, with a large cloakroom and washrooms adjoining. But in the many hours of the week when there is no performance in progress in the theater, the lounge can be used for line and music rehearsals, avoiding the waste of maintaining little used space. Accordion-type doors at the lounge entrances make the room private for rehearsal purposes. Furniture is made in movable units, each of the same design, permitting easy rearrangement for varied rehearsal requirements.

Aesthetic and Technical Problems and Solutions

By MICHAEL M. HARE

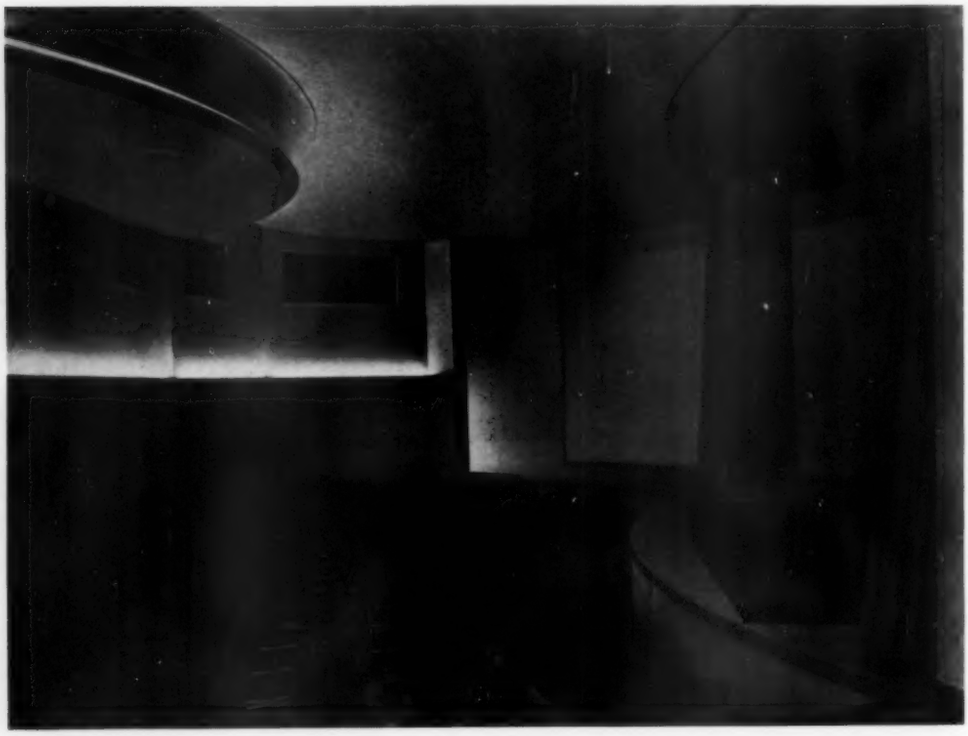
Architect of the Wisconsin Union Theater; Consulting Architect, Association of College Unions

THE lessons to be learned from this building are primarily concerned with plan and arrangement rather than with structure. The conventional steel frame was used in order to tie in with the existing building. When it comes to plan, a brief study of the building will rapidly demonstrate the seriously adverse effect which style requirements and symmetry forced upon the plan at the street-fronting end of the building. This is in very distinct contrast to the simple plan organization which we were able to achieve at the opposite or lake end of the building where the architects were given reasonably free rein.

Architectural Harmony: an Object Lesson

The almost disastrous effect which the requirements of symmetry and the Renaissance style of the existing adjacent building had on the plan should be an excellent object lesson to institutions which, all too frequently, saddle their architects with similar restrictions in the erroneous belief that the building which is contemporary in appearance and spirit can not exist alongside those built in a former period. The hub of the difficulty here was not that the new building was to be added to the old. In fact, a scheme was worked out which provided a simple and effective juncture between the two, but had to be abandoned, over the objections of the architect, due to the requirement of symmetry with the opposite wing of the old building and that the style be carried out on that facade.

Why academic authorities are so prone to this fallacious conception of architectural harmony is some-



Interior of the Play Circle, or Wisconsin Union Laboratory Theater

thing of a mystery. History shows clearly that in all the great universities of England and Europe style has succeeded style in an orderly progression and that widely different styles exist harmoniously in the same building. The lack of such harmony on our own campuses comes not from the juxtaposition of differing styles, but rather from the fact that in most cases these styles were anachronistic in the first place and the buildings are excellent examples of the paucity of imagination on the part of architects who therefore resorted to the well-known eclecticism of the 19th century, which unfortunately is continuing to the present day. It seems impossible to make an appeal to institutional authorities on aesthetic grounds, but perhaps with this example before us an appeal may be made on practical grounds.

Laboratory Stage: Answer to Small School Need?

Some additional comments may be made on the plan and arrangement of the specific facilities at Wisconsin and on the solution of acoustical problems with which the architects were confronted due to the plan.

The laboratory theater, the purposes of which have been explained previously in the article, has a potential development far in excess of the stage it reached at Wisconsin. This little laboratory theater at Wisconsin precludes its use in many types of production for which it would be suited if it had a normal size stage. The architects are convinced that the flexibility inherent in its form would solve many of the problems of the small college plan where the conventional gridiron type stage is not financially feasible. When small in size as at Wisconsin, great imagination on the part of the director is necessary in order to make any real use of it. However, if later studies indicate that it can be increased to full size, it will be possible to use the stage in a conventional manner as well as for experimental purposes.

No college can always be sure that it has an imaginative theater director or one who wishes to experiment. Yet, the architects feel that when some of the problems of sight lines are solved in studies now under way, this stage may be the answer to those who require a freer stage form for experimental work and yet must also have the possibility of conventional productions combined with a solution to the problem of a variable capacity auditorium.

Room Relationships: Isolating Sound

The relationship of certain rooms, one to another, necessitated by a functional plan, brought about some serious acoustical problems. As most architects now know, the problem of sound isolation is quite different from the problem of sound correction. One problem with which we were confronted was the position of the bowling alleys with relation to the main stage. Normally the sound from the bowling alleys would carry through any steel or masonry construction and be projected from the stage into the auditorium. This problem was entirely solved by the floating of the bowling alleys completely away from the steel frame on cork, the system of isolation being designed by Mr. Charles Potwin in association with the architect. This should give encouragement to those who wish to place such facilities adjacent to one another. However, acoustical isolation is a science and should not be entered into lightly without expert assistance.

Another problem of the same sort which even the best acoustical help failed to solve completely concerned the relationship of the stage shop to the stage acting area. The same procedure was followed here in that the two facilities were separated structurally by cork. Nevertheless, the existence of even a supposedly

soundproof door to the stage shop prevented this solution from being entirely satisfactory. The stage shop must give directly onto the stage, and probably in the future this problem will have to be solved by having an additional set of doors several feet away from the first set with a completely dead air space between. It is apparent that the usefulness of such a building is greatly increased if the acting area and the stage shop can be used simultaneously.

Another interesting problem in sound isolation which was successfully solved here was that of the theater lobby and that of the theater auditorium. The installation proves that it is possible under certain conditions to have adjoining spaces which actually open into one another without any doors, and yet to have sound from the one inaudible in the other. The gain in being able to eliminate doors from auditorium to lobby is obvious: the solution entails the trapping of the sound waves and their absorption before they can reach the openings. As a final word on acoustics, it should be kept in mind that in most cases the object is not to deaden sound, except where isolation is involved, but rather to so arrange reflecting surfaces that the sound may be clearly received.

Plans Must Vary with Each Situation

At a recent convention of speech department teaching staffs, questions were raised such as, "What height should the stage be above the auditorium floor?" There can be no standard answer to questions such as this, and the point is brought up here because it is exceedingly dangerous for architects or theater directors to lay down requirements on such matters. A great deal can be learned from a study of the Wisconsin theater, but no attempt should be made to adopt features of this building out of their context, any more than it is sensible to quote phrases from articles out of their context. In other words, the particular dimensions and arrangements of the Wisconsin auditorium were the result of a compromise reached after the development of something like twenty possible auditorium plans and sections.

A MODULAR LIBRARY FOR THE STATE UNIVERSITY OF IOWA

By R. E. ELLSWORTH

Director of Libraries, State University of Iowa, Iowa City

THE following article, which may be considered a sequel to the one published in THE AMERICAN SCHOOL AND UNIVERSITY for 1944, pages 97-99, consists of a discussion of a new theory of library planning and a description of the floor plans, at their present stage of development, of the proposed library of the State University of Iowa. The widespread interest in the type of planning and construction to be used in this building justifies the somewhat premature presentation of the Iowa plans which have not been submitted, at the time of writing, to the State Board of Education.

The Iowa structure, when completed, will occupy a space 300 by 300 feet and will be five or six stories high. The first unit to be constructed in the near future will occupy somewhat less than the 300 by 300 feet area and will not be more than three stories high. The firm of Keffer and Jones of Des Moines are the architects. Approximately one million dollars are available for the first unit.

What Is Meant by Modular Library Planning

The principal difference between the modular library and the traditionally planned university library lies in the fact that practically all of its floor area can be used either for book storage or for human occupancy, whereas in the traditional library specially designed quarters are provided for the bookstacks, the reading rooms, and the staff workrooms, and inter-use of the three areas is not possible without major reconstruction or remodeling. Thus, the space allocation in the traditional library gets out of balance over a period of years because the interior lacks flexibility. Then the library can function only through additions to the building, which usually lessen the unity of the library organization.

Modular planning means that the building will consist of a number of cubes of space, or modules, all the same dimensions. The dimensions to be used at Iowa will be either 19½ by 27 feet, or 22½ feet square, depending on which dimension proves more economical to use.

Each module is cornered by hollow steel columns which support the floors and carry the supply of air and other services, such as wiring or piping. Each row of columns supports, in one direction, floor girders, which in turn support prefabricated floor pans running from girder to girder. The floor pans are covered with a sound-deadening substance on top of which is laid the floor covering. These pans serve as air ducts and supports for light fixtures and other services and also contain acoustical and fireproofing treatment. Columns, beams, floor pans, and the ceiling plates can all be prefabricated and surfaced at the factory.

The size of the column depends on the amount of air to be supplied, the dimensions of the building, and the number of stories. In the Iowa building, they will be approximately 18 inches square, including a fireproofed covering if one is necessary.

Air-conditioning machinery will be placed on the third floor, and above this will be a special story, three to six feet high, to be used for air ducts, with space provided to accommodate fans and blowers. This equipment would ordinarily be located in the basement, but the site of the building at Iowa does not permit this. The fourth, fifth, and sixth stories will, at a later date, continue above the special six-feet story. Air will be fed up and down through the columns which will be half the size they would be if the machinery were located either in the basement or in the top story. Since traffic above the third floor would be expected to use elevators anyway, the additional vertical distance caused by the six-foot story does not appear to be objectionable.

The floors will be approximately 15″ thick, and the ceiling heights will be about 8′ 6″ in the clear throughout the building, except in special areas where it is desirable to open up two-story heights. This, incidentally, can be done at any place in the building, either at the time of initial construction or at a later date.

Origin of the Plan

Modular planning for libraries was proposed by Angus Snead Macdonald, president of Snead and Company, and first stated in an article in the *Library Journal* in 1932.[2] This idea was used for the first time in the Colorado State College of Education Library, although modular library stacks have been commonly used for many years. During the last year, Snead and Company have built a full-scale mock up of a two-story modular building at their Orange, Virginia, plant. All of the mechanical and engineering problems involved can be studied at the mock up, and its use as a library can also be seen there. The dimensions of the module are 13′ 6″ by 19′ 6″ on column centers, these being the dimensions contemplated by the University of Iowa at the time the mock up was built. Present thinking suggests the advisability of doubling the size of the module to 19′ 6″ by 27′ for the Iowa library.

Modular planning can be achieved either by wet or dry construction, the principal difference being that they require different systems of air supply, have dif-

ferent floor thicknesses, and permit different degrees of flexibility. Since dry construction makes possible prefabrication of all parts, shortens the time of erection, offers lower building costs, and insures ease of internal remodeling at a low cost, it has been considered the more desirable method of construction.

Dry Construction and Its Advantages

One of the significant advantages of dry construction in modular planning is the possibility of having the structure itself act as carrier for all the services; that is, light, heat, and ventilation. The elimination of a separate system of air ducts reduces ventilation and air conditioning costs considerably. Furthermore, the use of columns and floor pans as air suppliers facilitates the introduction of air (and the same is true of light fixtures) at any given point in the ceiling area, and thus makes possible the free interchangeable use of modules. It also permits the subdivision of modules into small rooms for carrels, conference rooms, etc.

A second advantage arises from the fact that all interior walls are freed of the necessity of carrying services (wiring, piping, and ducts), which means that the walls can be moved without interfering with building services. Since the wall panels can be dry, moving them does not involve the noise, messiness, and time loss usually associated with interior remodeling. In moving this type of partition, there is complete salvage of materials.

A third advantage arises from the low ceiling heights which permit, indeed almost force, one to create an informal non-institutional reading room atmosphere such as would be found in a home or club library, something which is seldom achieved in the traditional library. Greater height can be secured in the modular library, to provide a two-story reading room, by removing the floor pans within one module, or along a row of modules. This can be done at the time of initial construction or at any time later.

Interior Planning of a Modular Library

Except for certain elements (elevators, main stair wells, toilets, and book conveyors), the location of which would be permanently fixed, a modular library about to be occupied consists, at each floor level, of a series of rows of columns, with no further interior subdivisions of any kind. All such subdivisions are created by means of equipment and furniture, not by means of bearing walls. Movable wall panels can be purchased and installed as part of the equipment, not as part of the structure, although obviously the structure must be planned in terms of dimensions that will permit their installation.

Books are to be stored as in the traditional library, except that the shelving in the stack area (if there is to be one) is free-standing instead of multiple-tier construction. Since ceiling heights in the Iowa library are to be 8′ 6″, and since readers cannot readily use shelves above 7′ 6″, the additional foot of space above the shelf height accessible to readers can be used for shelving little-used books, or it can be left empty. The tremendous saving in cubage in the parts of the building devoted to human occupancy makes the wastage of space above the book shelves a matter of small consequence, especially when the location of the stacks does not have to be confined to any specific place in the building.

Wall partitions can be placed wherever desired within a module though the basic wall lines would be from column to column.

The columns, as can be seen in the accompanying floor plans, are made to disappear by making them parts of lines of book shelving and wall partitions. Since a double-faced bookshelf is normally eighteen inches thick, the columns merge nicely with lines of shelving. There need be no columns, or very few, standing in the center of reading rooms.

The first step involved in laying out a floor in the modular library is to decide upon the library organization. This has to be done individually, in terms of what the library wants to do, and hence cannot be discussed in the abstract. The second step is to determine the point of control, the placing of building services, and the lines of traffic. The third step is simply to arrange the equipment to achieve the desired result.

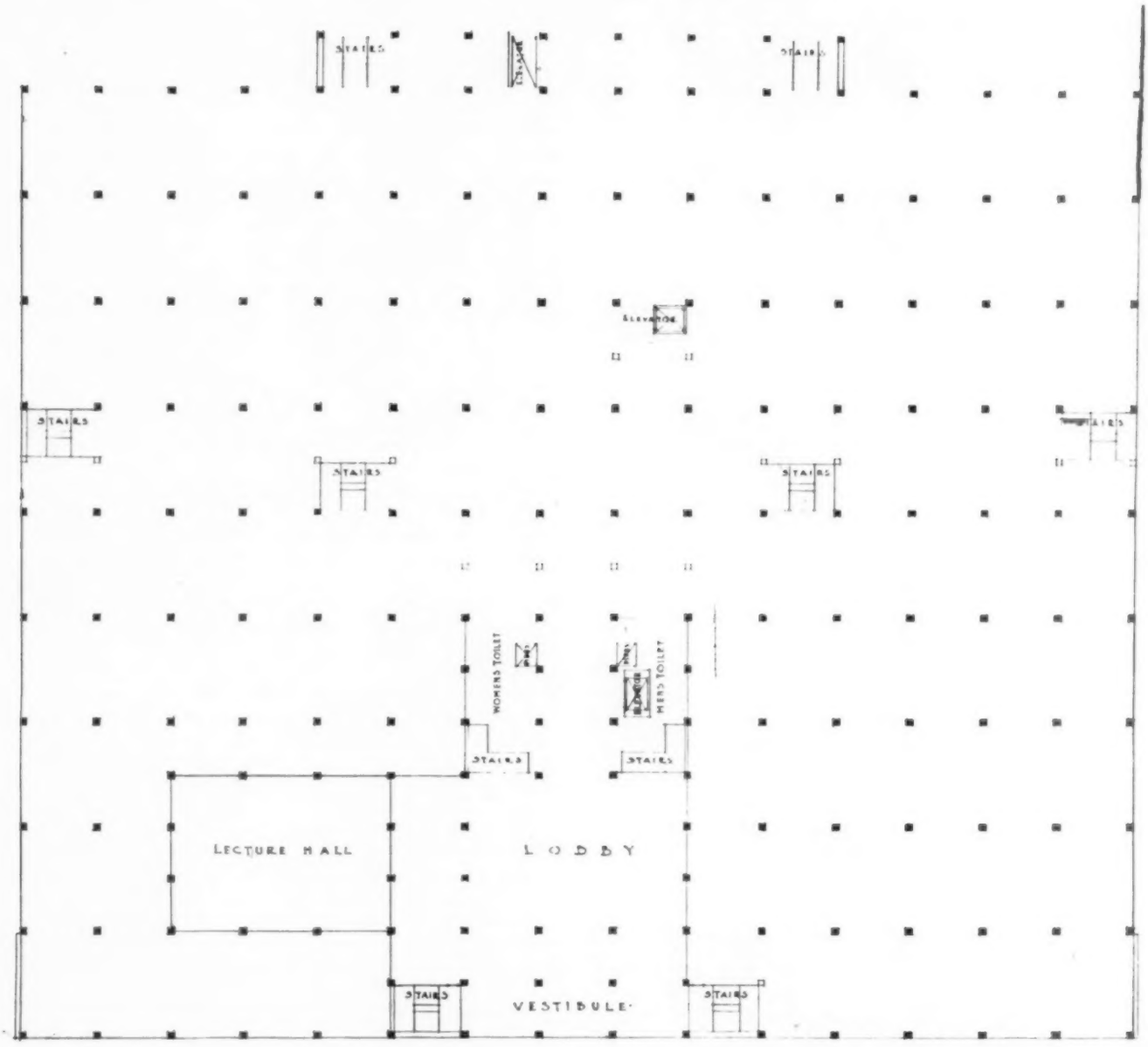
This method of approach greatly simplifies the development of library plans from the point of view of the architect as well as of the librarian because the librarian can change his mind as much as he pleases without causing the architect to remake a large number of studies. The architect can start by supplying the librarian with a number of floor plan blanks which show only the location of columns. Together they can develop the essentials of the library plan, which determine the place of the fixed features. Once the furniture and equipment have been designed for one module, this is done for all the rest of the modules. The architect can then develop his exterior and his specifications, and the librarian can work out his own layout, although he will most certainly need the advice and guidance of the architect.

The interior is planned independently of the exterior, except, of course, that the exterior determines the outline of each floor drawing. Modular planning does not bind the architect to any one building style, though the more his design departs from a square or rectangle, the less efficient the interior will be in terms of utilization of space.

A modular library of dry construction enables the owner to afford air conditioning, thus freeing the architect of the necessity of adopting a dispersed structure, which always raises building costs, in order to secure natural cross ventilation. Natural lighting too, though eagerly sought by most library planners, when considered objectively, is of doubtful value in most parts of the country as a source of light for readers. Its use in the modular library can probably be justified only in terms of the psychological value of being able to see out—especially if there is something worth seeing.

The Iowa Plan—Brief Summary

The purposes for which the structures will be used have been stated in the brochure, *The Library as a Teaching Instrument,* published by the University in 1945. The accompanying floor plans show how the first four floors will be laid out to implement the program. Several methods of arranging the equipment are shown, because it is impossible to predict solely on the basis of theory just which method will



Typical plan, showing permanent construction. Proposed first floor plan, University of Iowa modular library (page facing)

prove satisfactory. In fact, it is possible and even desirable to have several arrangements in the various parts of the building. The modular library idea permits the librarian and the architect to experiment without the risk of committing costly errors.

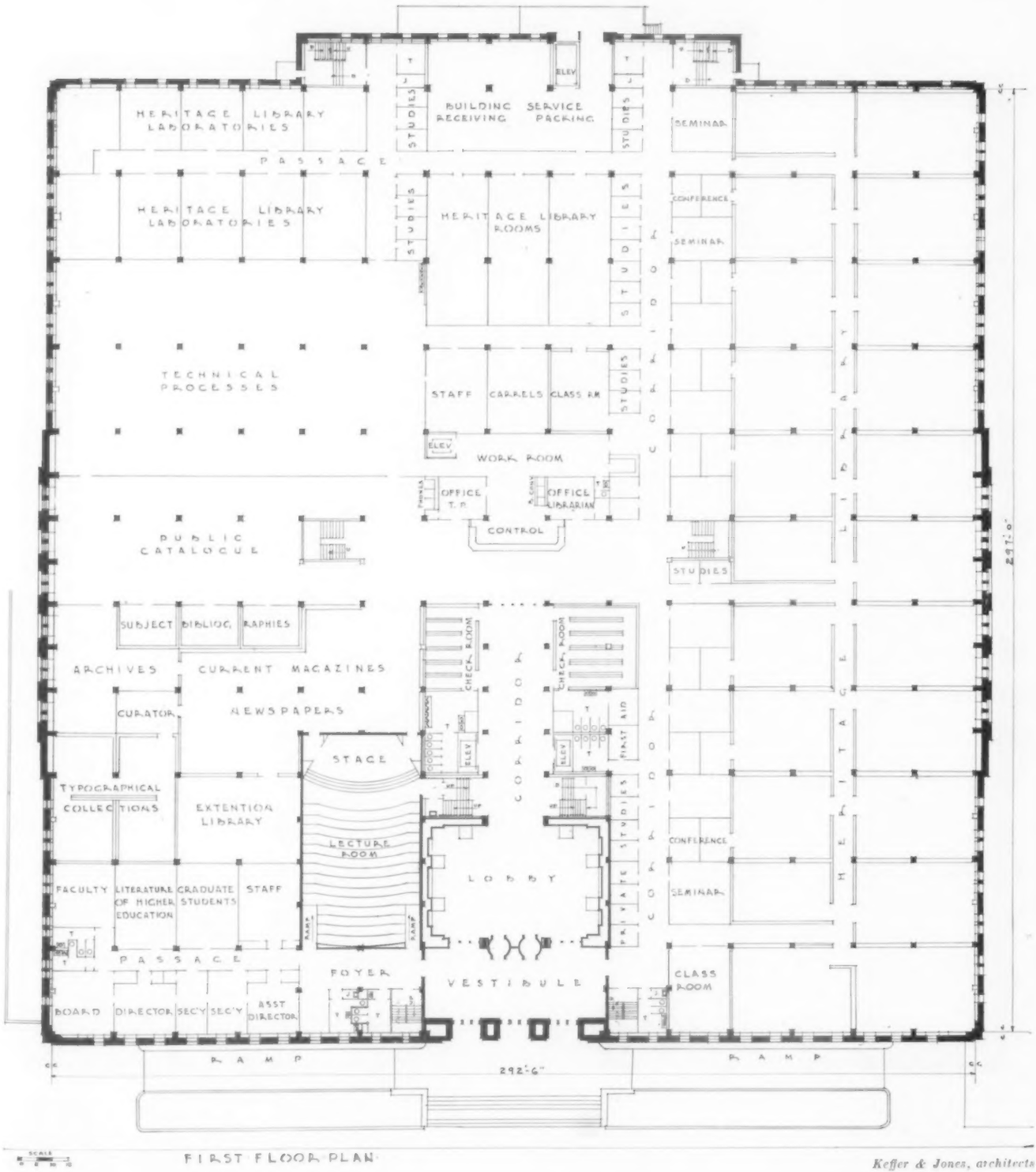
Arrangement of Floors

1. *Heritage Library.*—Entrance at the street level opens into a two-story lobby, which on the left gives direct access to a lecture auditorium seating about 250. Here the university will offer a program of lectures, forums, debates, motion picture films, slides, lectures, and broadcasts of all types, devoted exclusively to contemporary problems.

This service is part of the Heritage Library which occupies the east third of the main floor. The Heritage Library provides seminars, conference rooms, visual aid rooms, and offices for instructors and counselors (a total capacity of about 800).

The Heritage Library attempts to implement the general education function of the Arts College. The library part of this service may be thought of as a dramatized syllabus of the history of ideas. It is a library museum of the most important contributions of human history, presented visually and dramatically in the best museum manner on a chronological basis centering around various focal points in human history.

The Heritage Library will contain the assigned readings in the core courses. The books will be placed so that students who go to the library to study will be surrounded by a visual presentation of facts and ideas that will help them fix in their minds the chronological development of human culture—in an anthropological



FIRST FLOOR PLAN

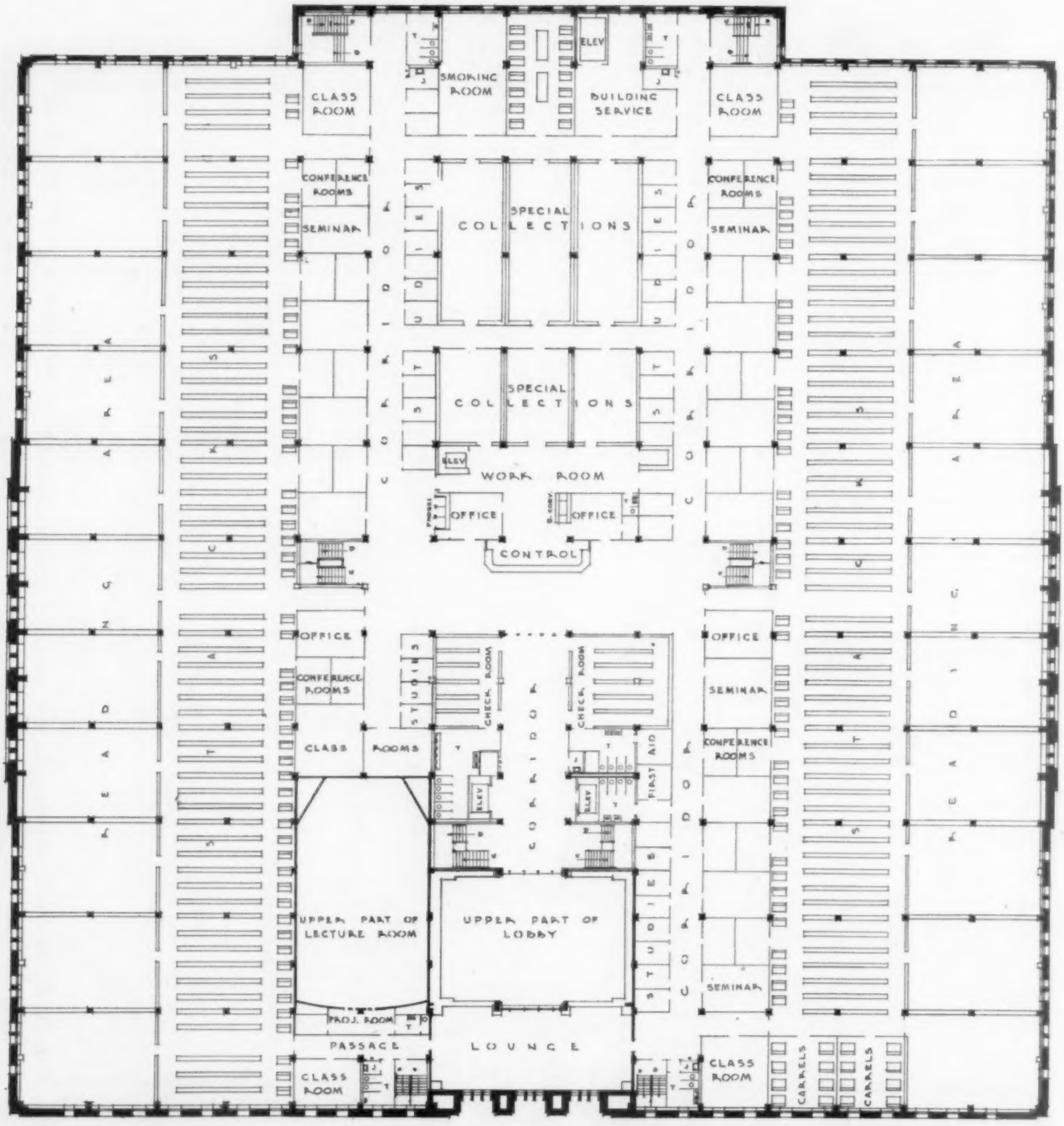
Keffer & Jones, architects

sense. This is, of course, not to be thought of as the end of general education, but only as the inescapable introduction. The Heritage Library stands as a symbol of the unifying elements in liberal education.

2. *Main Floor—Center.*—The central spine of the main floor contains, in front, certain fixed services, such as cloakroom and restroom, stairways, elevators, and a floor control. In the rear will be the staff room, a microfilm laboratory, receiving room, and a freight elevator.

There are six fire emergency exits located on the periphery of the building. These are to be used only in emergencies. There is only one normally used entrance to the building.

3. *Main Floor—East*—The east third contains three groups of services: First, opening directly off the



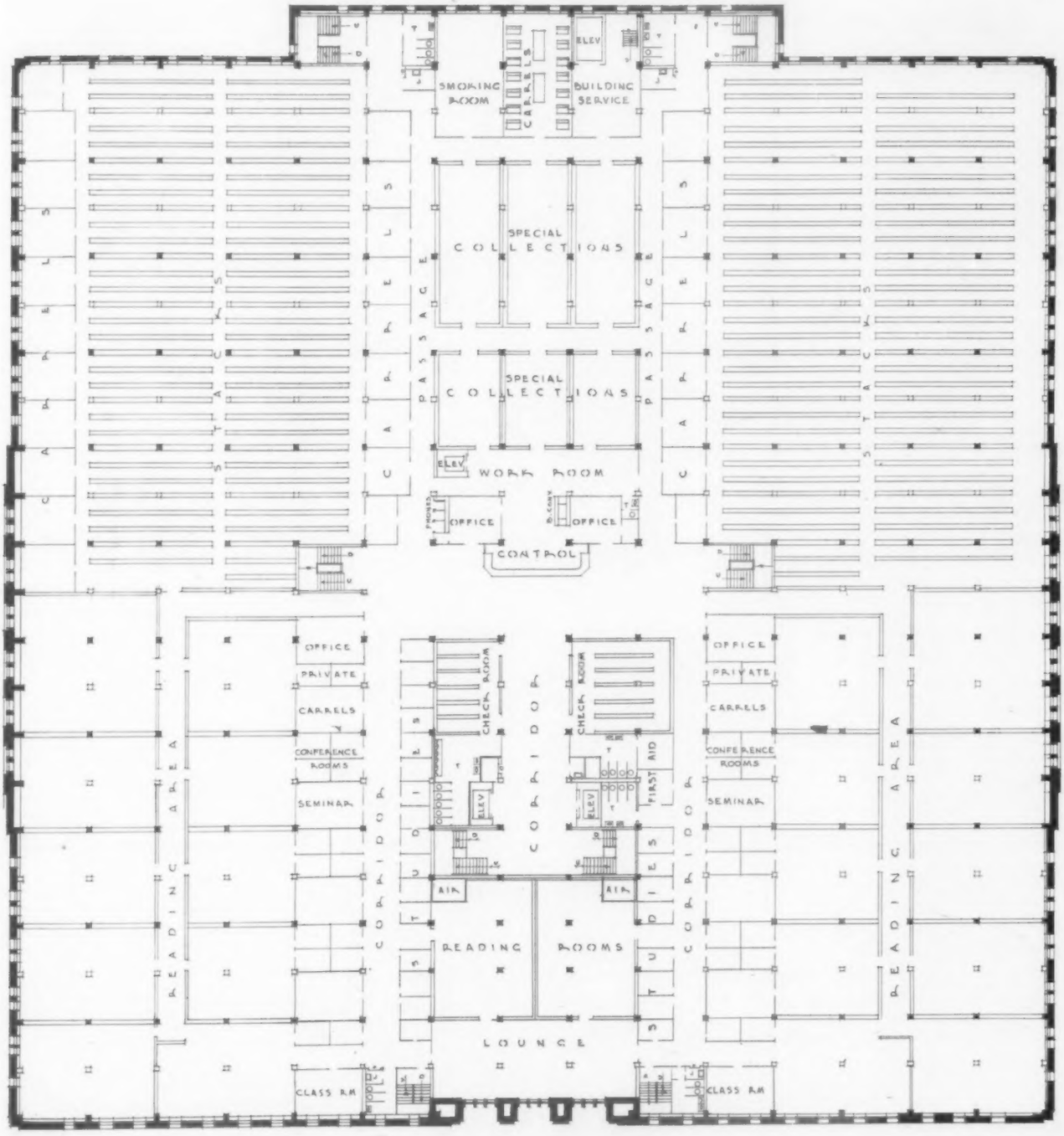
SECOND FLOOR PLAN

Alternate arrangement shown in third floor plan (page facing)

lobby are the administrative offices and four special rooms: faculty and graduate student rooms, a "Literature of Higher Education" room, extension library, and an archives library. Second, opening off the central control area is a series of rooms for a group of special collections, as well as space for current issues of newspapers, magazines, and new books. Third, there is space for the public catalog and the technical processes.

4. *Other Floors.*—The second, third, and all other floors will be arranged according to a variety of patterns. Two arrangements are presented in the accompanying drawings. The second floor plan spreads out the bookstacks in a long line from front to rear and likewise spreads reading areas along the outer walls. The third floor plan groups books in the rear and readers in front. The arrangement of carrels in the third floor is somewhat different from that of the second, in that they are placed in modules along the outside wall in the bookstack area. Seminars and offices in both plans open off the main corridors.

Common to both plans or other variations, is the

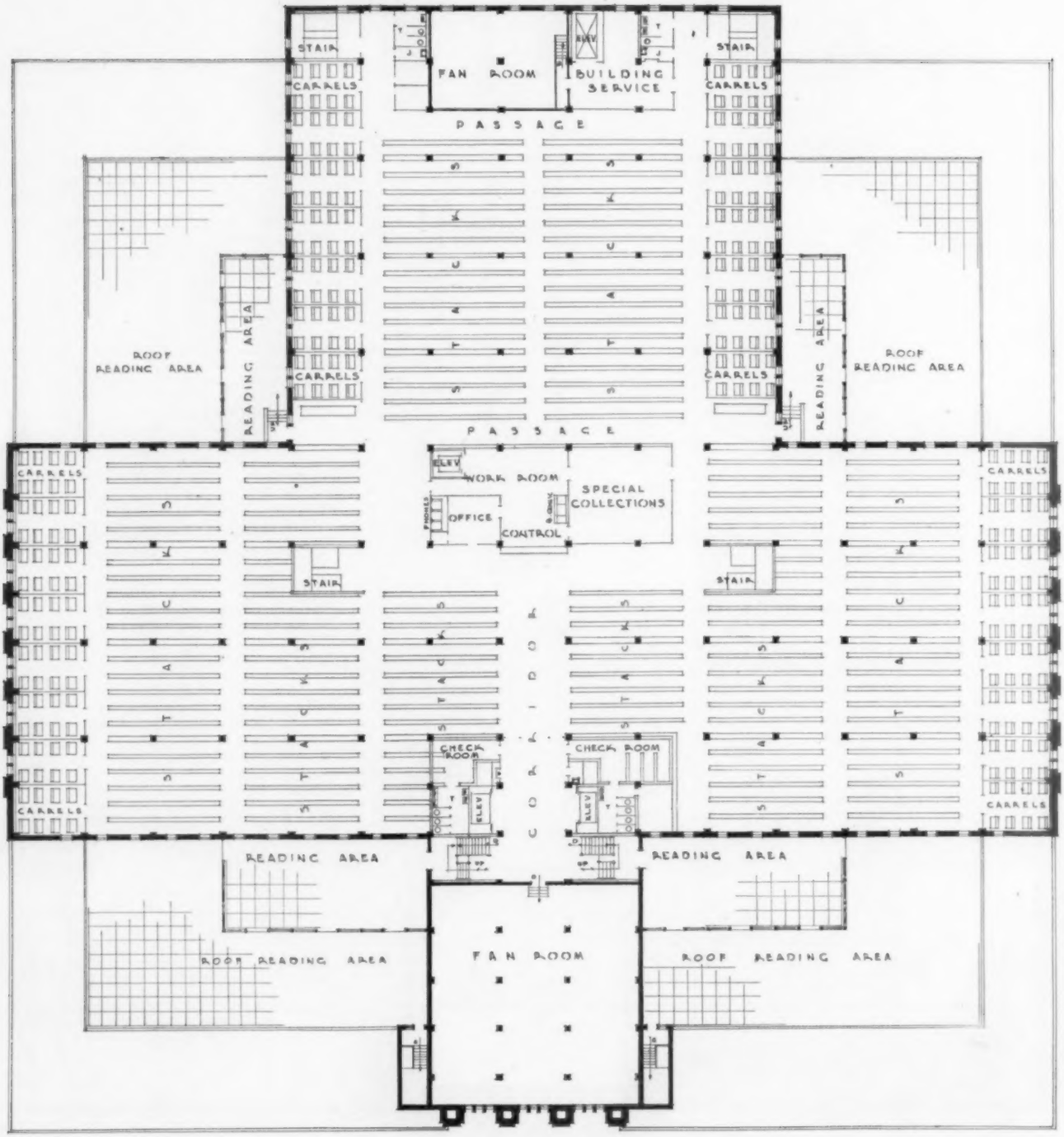


SCALE

THIRD-FLOOR PLAN

idea of a series of subject centers for advanced undergraduate and graduate work, each of which provides seminars, offices, teaching aid rooms, storage books, carrels, up-to-date reading room collections, and reader space. The large reading areas will be subdivided by means of free standing bookstacks containing the following categories of material: reserve and reference books, journal files, and a collection of the most used up-to-date books not on reserve. All books, both in the stack area and around the reading rooms, will be freely available, but all will be carefully checked at the control desks. No one subdivision of any of the large reading areas will seat more than about thirty readers without an intervening island book case. Informal clubroom furniture will be used as much as is possible. Our objective is a series of homelike reading centers attractively furnished.

Classroom and seminar use will feed directly into the corridors so that the resulting noise and confusion will be well insulated from readers. Ideally, there should be a sufficient number of offices as well as of



FOURTH FLOOR PLAN
FIFTH FLOOR PLAN SIMILAR

conference rooms to permit incorporating all of the social science and humanities departments into the library. This will not be possible in the first unit, but it is contemplated in the ultimate structure.

It should be emphasized that the floor area in more than two-thirds of the building is capable of accommodating any library activity at any time without structural revision. This space is subdivided by means of movable wall panels and free standing book cases. This flexibility is made possible by modular construction in which the structural columns carry the building services, thus freeing the wall panels of elements which ordinarily would cause them to remain fixed permanently.

Grouping of Library Material

The Iowa library is based on the grouping of all types of library materials according to subject rather

than by library function, such as reference, reserve, circulation, etc. The subject base will be divisional insofar as this is possible at the present time. Each subject cluster will contain the following typical elements: seminars, offices, visual aid rooms, carrels, "storage books," reading room books, and reader space. Each floor will have its own special collection rooms, so that the rare book collections can be kept adjacent to the subject field concerned.

The central public catalog (on the main floor), in addition to serving as a union catalog, will show the location of each book in the building. Each floor will have a catalog of the books on the floor. Readers may go directly to the shelves for the books they want, or they may ask an attendant to page their books. Both "storage book" collections and reading room collections are to be on open shelf and will remain so, unless experience demonstrates that this is not wise. Irreplaceable materials will be removed from the open shelf collections and placed in the special collections rooms directly behind the desk control.

Reader Control

Experience alone will define the manner in which readers will be checked as they pass each floor control. However, the inspection will be rigid at first. Careful study of the plans will show that the reader is checked at one floor control only, though he may select the floor control through which he wishes to pass. In other words, a reader may take a book from the shelf on the third floor, go down a side stairway to the first floor, and have his book checked at the control desk on the first floor. The book record would immediately be sent back to the third floor.

It can be seen from the illustrations that the corridor space is perhaps more generous than would be true of the typical library. This is necessary because there is to be considerable class or group activities in the library, with resulting heavy corridor traffic. Since the group activity will be concentrated in rooms opening off the main corridors, and since there is a row of rooms between the corridors and the reading areas, there should be no interference. The heavy occupancy desired in this building (approximately 800 persons a floor) dictates a floor plan that flows the heavy traffic through the central part of the building and locates the reading areas along the outer edges. This may seem to place a penalty on the individual who goes to the library to read only, because it makes him pass through areas which are not related to his purpose, but since the library is to be a teaching center, as well as a reading center in the traditional sense, a good many new elements have to be taken into consideration. It must be remembered that the completed building will have a capacity of approximately 5,000 persons, a fact indicative of the purpose to which the library is to be put.

The Staff

There will be two divisional subject centers on each floor, and each center will be under the direction of a librarian who will have not only suitable training in librarianship, but also an education equivalent to the doctorate in one of the divisions of the center. This librarian, who will have faculty rank and will be compensated according to faculty scales, will be expected to maintain an active role in the teaching and research program in his center and be responsible for building the library collection in his area. His primary responsibility will be to see that the activities of his subject center are kept harmonious with the needs of the student, the teacher, and the researcher.

There are several activities the librarian may undertake as a means of keeping in touch with the instructional program. He may teach a regular course in a department; he may give a course in bibliographical methods for graduate students; he may direct student theses; he may have charge of the program of college teacher preparation mentioned before; and necessarily he must be active in research.

The administrative activities of the center will be under his direction, but the routine activities will be handled by people with less training than is ordinarily associated with a professional librarian. It is our intention to raise librarianship to its potentialities.

The methods to be used in bringing about this conception of librarianship are presented in the article, "Training for Divisional Reading Room Librarians," *College and Research Libraries*, December 1944.

Student help will be used for the shelving and paging of books. Supervision of the reading areas will be automatic in that librarians, student assistants, faculty members, and graduate students will be generously represented in the reading rooms at all times.

Summary

This article presents an analysis of modular library planning, with special emphasis upon dry construction, a brief description of the Iowa library building plans, and a short summary of the way in which the plan will function. The article attempts to emphasize the building structure and to minimize the library program contemplated, because the latter has been discussed in more detail in the *"Library as a Teaching Instrument."*

PLANNING A NEW SCIENCE BUILDING

Introduction

By PHILIP E. HENDERSON

President, Western College, Oxford, Ohio

IN February of last year the Buildings and Grounds Committee of the Board of Trustees of Western College recommended that steps be taken immediately to erect a science building. Mr. Cellarius was selected as the architect to prepare the preliminary plans. At the June 1945 meeting he was instructed to prepare the final plans for approval at the October meeting. All during the summer the architect and the writer worked with the heads of the various departments with the hope of incorporating as many of their ideas as possible. The department heads visited various colleges where they observed basic practices and methods. The final plans are the results of the work of those department heads who will be using the building as well as of the architect and engineer.

The building is being financed partly through gifts and partly through loans. The interest rate on these loans is approximately 2¼%. It is expected by the centennial year, 1953, all indebtedness on this building will have been cleared.

Construction Details

By CHARLES F. CELLARIUS

Architect, Cincinnati, Ohio

THE science building for Western College for Women at Oxford, Ohio, is designed to house the departments of chemistry, biology, and physics, with some classroom space to be used for mathematics and psychology. The plan is based on a college enrollment of 500 students, the estimated requirements for the building being increased proportionately from an enrollment at present of 375.

Site and Architectural Style

The building is located on open rolling ground, not far from the center of the college, but with adequate space all around it. The exterior walls of natural local stone conform to other recent buildings of the college. The roof is of green and purple unfading slate, and double hung steel windows of large size provide ample light for all interior areas.

The building is in a modernized Colonial style, adapting the Colonial tradition of the college to the needs of a science building. The building is of fireproof construction, excepting that the roof is carried by wood rafters. Floor slabs are of concrete with metal dome construction.

Building Materials and Mechanical System

All interior walls and partitions are surfaced with iron spot building block 4″ x 5″ x 12″ in size, except that basement partitions are of painted cinder concrete block, and corridor and stair hall wainscots are of glazed ivory colored block. Walls of offices, classrooms, and lecture rooms are plaster.

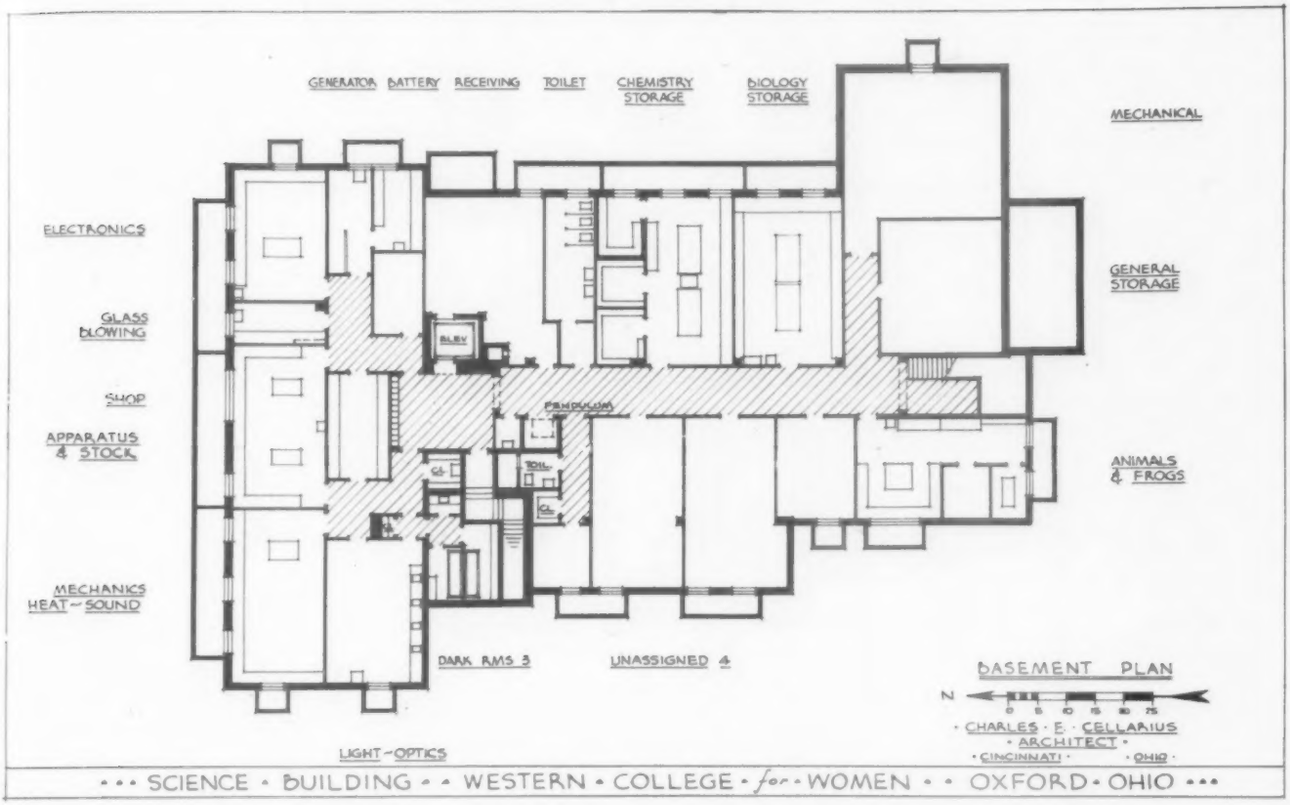
For floor finish, asphalt tile is used generally in classrooms and laboratories, cement floor in the basement, and rubber tile in the first floor lobby and corridors. All laboratories, lecture rooms, and circulation areas have acoustic tile ceilings.

The building is heated by low pressure steam system, using a combination of convectors and unit ventilators. Exhaust or gravity ventilation is provided from all rooms. No boilers are included, for steam is obtained from a central plant.

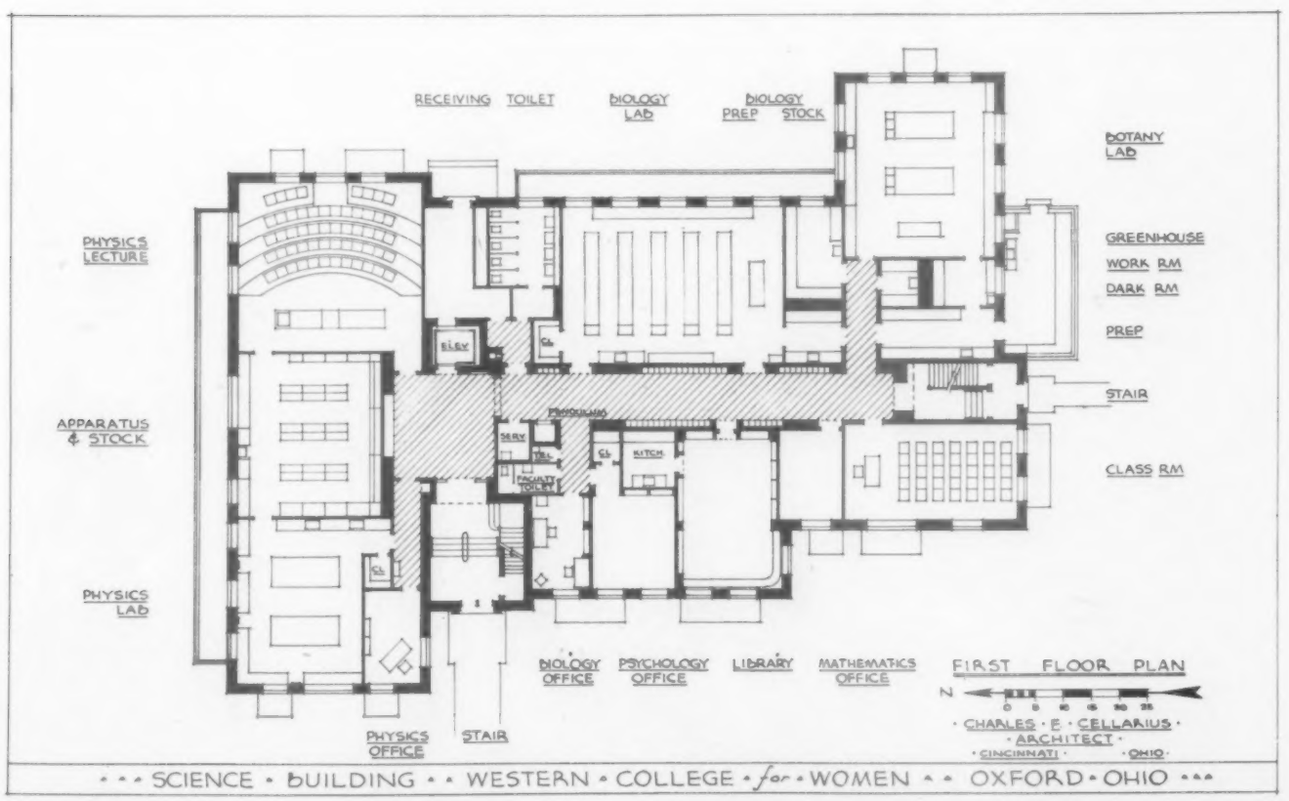
Comments on Floor Plans

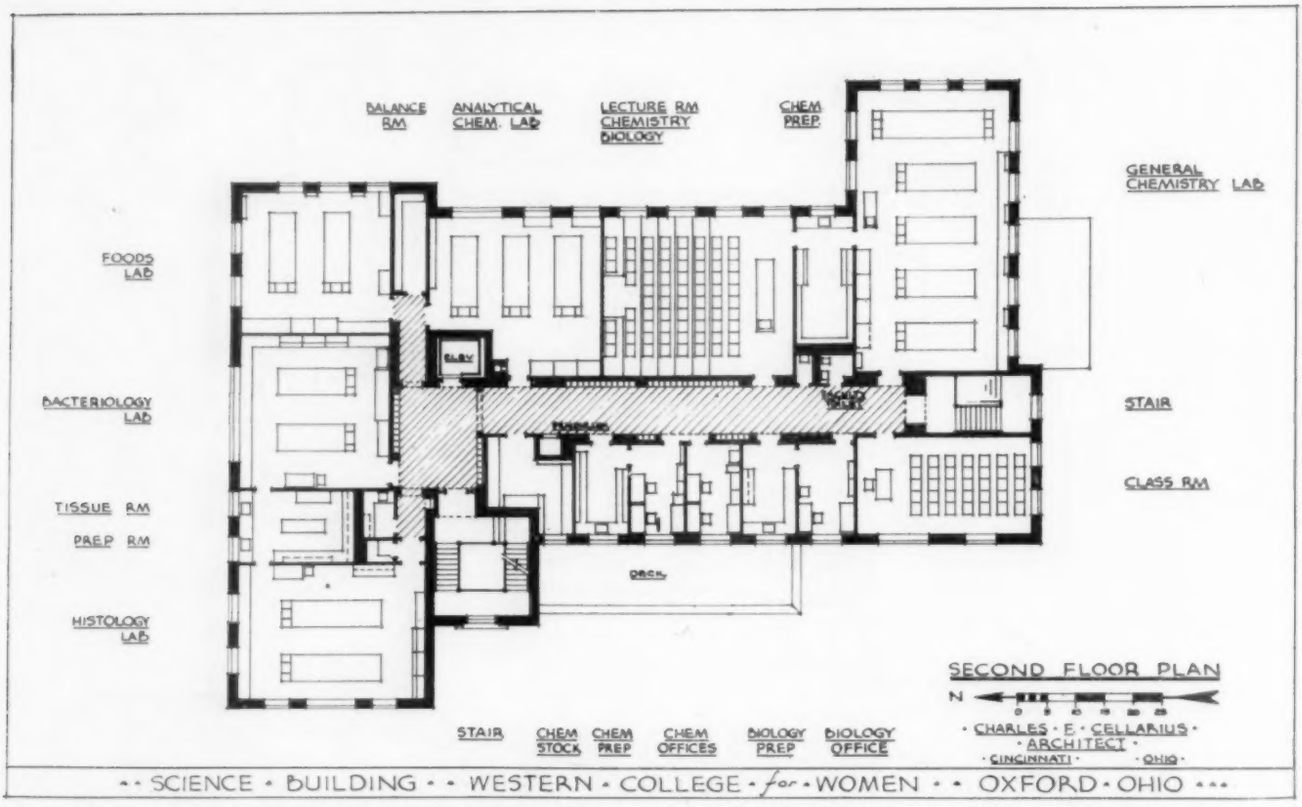
The basement fills minor requirements of the physics department and also contains storage and service rooms for all departments. The physics laboratories in the basement are for electronics, heat, sound, light and optics, photographic dark rooms and glass blowing.

The main lecture room and laboratory of the physics department is located in the north wing of the first floor. A large lecture room to accommodate 55 students will have raised seat platforms designed for maximum visibility. The lecture table, twenty feet long, is built in three sections, with the end sections stationary and the center section removable. This feature enables the instructor to set up a demonstration on the center section, before the lecture be-

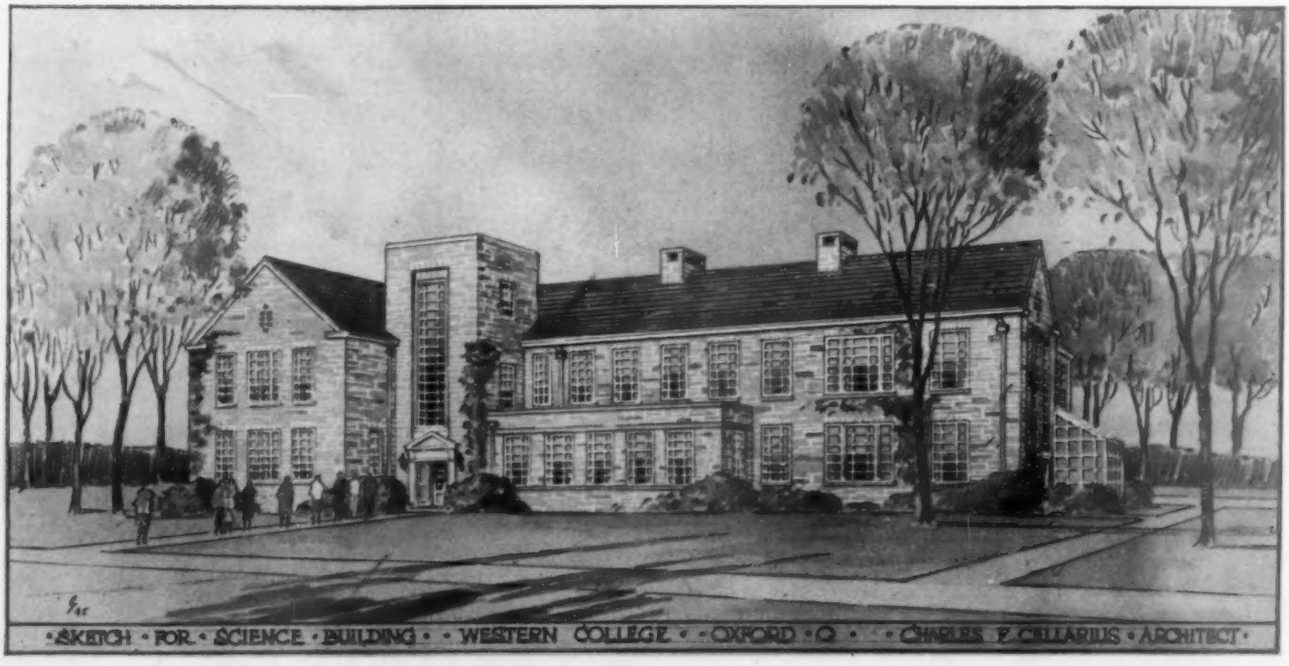


Above—In the basement are physics laboratories and storage and service rooms for all departments. Below—Biology and botany laboratories as well as main physics laboratory are on the first floor. Note kitchenette for servicing teas in the library





Chemistry and advanced biology are to be taught on the second floor. All lecture rooms and classrooms will be equipped for the showing of films and slides. Astronomy classes will use the flat deck portion of the roof and the roof of the tower



gins, and then roll it into position when required. A large combination apparatus and stock room, with cases for apparatus and permanent set-ups for lecture room and elementary physics laboratory, is located between the two, as can be observed on the accompanying first floor plan.

In the front of the first floor are offices, classroom, and library, with a kitchenette adjacent to the library for serving refreshments at meetings of faculty or small groups.

The rest of the first floor is devoted to the general biology and botany laboratories. A small greenhouse, with the necessary preparation and workrooms, is located off the botany laboratory.

The chemistry department occupies the second floor of the building, together with the advanced biology laboratories. The chemistry facilities include a general chemistry laboratory with stations for 44 pupils, an analytic and chemistry laboratory with stations for 24 students, and a foods laboratory for 16 students.

The advanced biology laboratories are for bacteriology, 12 stations, and histology, 16 stations. A classroom and five offices are provided together with a main lecture room for the chemistry and biology departments. This has raised platforms for seating and will accommodate 75 students. All lecture rooms and classrooms will be equipped with black-out shades and moving picture machine outlets.

The flat roof deck over part of the building and the roof of the tower have been made available for the use of astronomy classes. Display space is provided in corridors, and particularly in the first floor lobby, since no special museum room is included. An anemometer on the tower will register the wind direction; and an indicator in the lobby, its velocity.

Laboratory furniture will be of wood, in stained silver gray finish. Shelving is mostly of metal, in baked olive green enamel.

LAGUNITA COURT, A NEW TYPE OF DORMITORY FOR WOMEN AT STANFORD UNIVERSITY

By BARBARA RYAN

President, Casa Adelfa, Lagunita Court, Stanford University, California

IN the early 1930's it became apparent to the officials of Leland Stanford Junior University that more and more women were interested in a college education. The enrollment of women in the university was increasing rapidly, and there was a definite need for additional living space. The site for a new dormitory was decided upon, and construction began. In 1935 the modern, practical, and attractive structure was completed.

This is Lagunita Court, the home of 285 Stanford girls, and one of the largest and newest dormitories in the entire country. It is unique in that, built around a large inner court, it combines six living units into one, thus retaining for the girls the advantages gained through residence in a large dormitory, and at the same time giving them advantages that formerly belonged only to those in sorority houses.

Physical Features of Lagunita

A striking feature of the Court is its lobby. In the older type of dormitory there is usually just one large lobby in which girls may receive and entertain their guests. This spacious tile-floored room of Lagunita is informal and is often used for entertainment purposes. Two comfortable social rooms, one to either side of the lobby, are provided for the girls and their guests. Guests may also be taken from the lobby, through the inner court, into social rooms of any of the four *casas* which open onto the court. Four of these rooms are provided with libraries, and two with pianos. All four have connecting "study rooms" and alcoves where bridge or other card games may be carried on. The two back *casas* have similar "browsing rooms," into which no guests are allowed.

Another advantageous feature of the Court is the numerous terraces it possesses. The four front *casas* have sheltered terraces just outside their social rooms, and these are large enough to permit porch swings, chairs, and a table to be placed on them. Both the dining room and the lobby open onto terraces in the inner court. The one which is connected with the lobby is roofed, while the one which adjoins the dining room is not.

The girls particularly appreciate the facilities available for sun bathing. One of the back *casas* has a high-walled enclosure for just such purposes, while the other has an open passageway which overlooks the lake.

There are 264 single rooms in Lagunita, and 21 doubles. Each room is equipped with its own closeted wash basin, a dresser, bed, desk and chair, bookcase, and a wicker chair. Any additional furniture or decorations must be provided by the students.

Cooking facilities are available to the girls, since each *casa* has a fully-equipped kitchenette. Several of these have ironing boards, which are purely for convenience, since there are laundries in the basements of both sides of the Court. These laundries are complete with tubs, ironing boards, and driers.

Lagunita offers several special features to the girls, one of which is the photography dark room. This basement room, which is completely equipped for developing, printing, and enlarging, may be used by any member of the Camera Club, or by any girls in Lagunita. In addition, there is a Court picture collection, from which the girls may rent pictures for a quarter, or the year, to aid them in room decoration. Another feature provided by the Court is its collection of five hundred or more records, which may be used by any individual or group. This is aside from the collection each *casa* possesses.

Administration of Lagunita

Lagunita's construction has proved to be very advantageous to the girls. Because of the manner in which it is divided into living groups of fifty, they have more chance to make use of initiative. Their opportunities to prove their leadership ability are greater than in the older dormitories and in the sororities. The girls who prove themselves the most capable in their *casas* usually advance to Court, and often campus, positions of importance.

Each *casa* has a president who directs the affairs of that particular group. She represents her *casa* at the executive committee meetings, which are attended by all *casa* presidents, Court officers, the director of the Court, and the assistant directors, as well as anyone else who wishes to do so. The process is democratic. The director and assistant director attend the meetings merely to offer their viewpoints and suggestions when they are needed. Those present exchange ideas and suggestions as to activities and problems. Their conclusions are brought back to the *casas* by the presidents to be presented at the weekly meeting for further discussion and an expression of either approval or disapproval.

The vice-presidents of the *casas* supervise the plans for activities among themselves and with other groups. The girls like to give spreads for themselves, particularly during finals. Get-togethers, in the form of teas, parties and picnics for both women's and men's groups frequently enter into the discussion and are put on the



Inner court entrance to Casa Magnolia

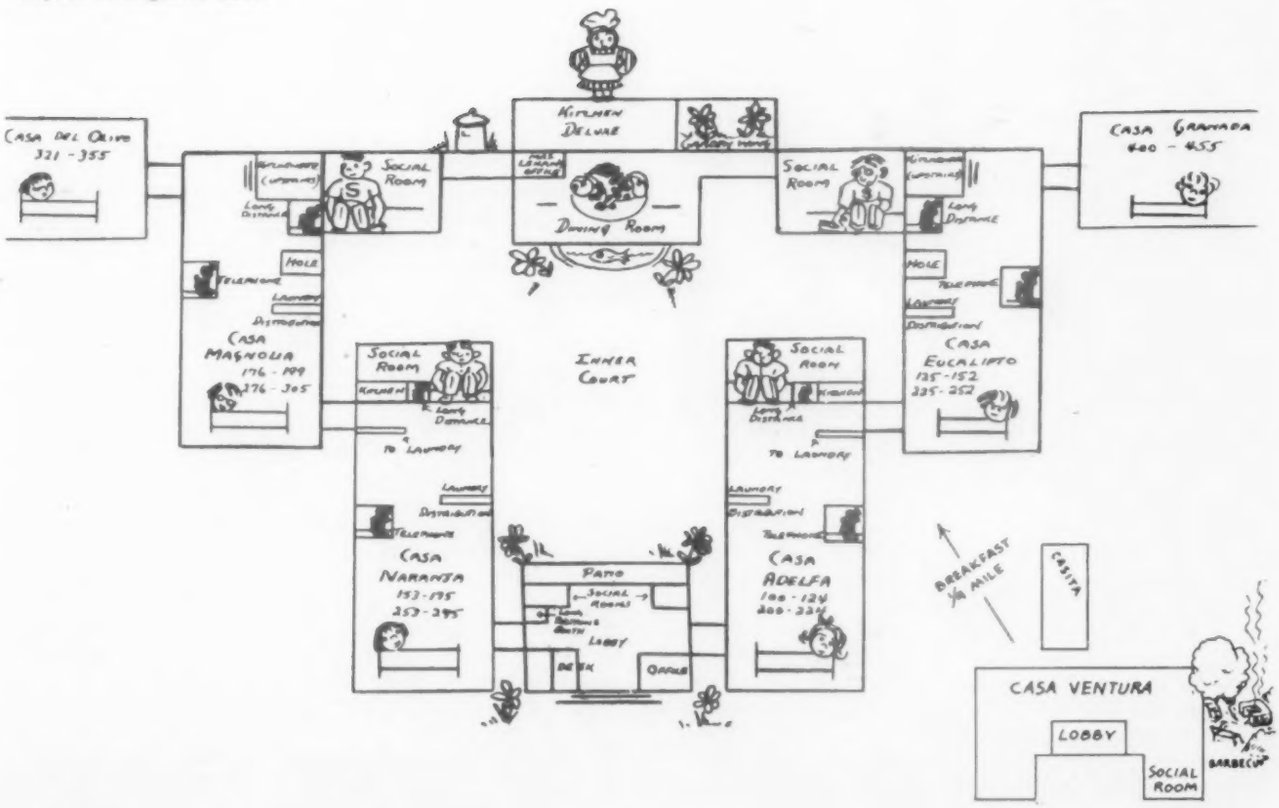


View of dining room from inner court



Inner court entrance to Casa Naranja

Layout of Lagunita Court

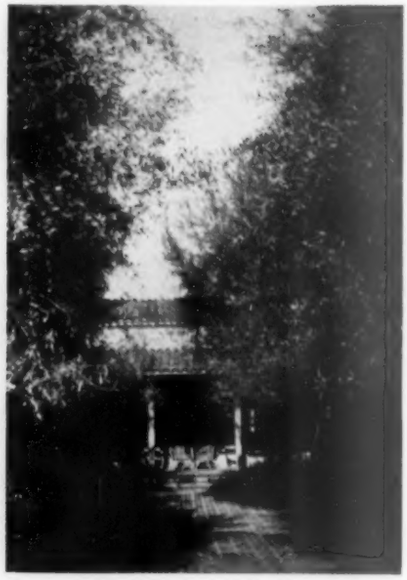




View of Lagunita Court, showing Casa Naranja and main lobby entrance



The lobby, as seen from the inner court



Adelfa terrace, as seen from Casa Eucalipto social room

casa's quarterly schedule. It is a tradition that sometime during the course of the quarter each *casa* has a "faculty night," which consists of inviting several members of the faculty to dinner and after-dinner coffee in the social room. This has been a great aid in establishing a friendly relationship between the students and professors.

The Court, as a single unit, is not lacking in traditions. Once every quarter Lagunita sponsors a dance which is formal in fall and spring, and informal in winter. All-Lagunita barbecues have become very popular. They are fine mixer affairs, and since there is an ideal site for them, with a lake and large barbecue pit directly behind the hall, they are found to offer a pleasant diversion from eating in the dining room. Two birthday dinners are arranged yearly, with each girl included in either one or the other of these festive occasions. The Court officers, made up of girls from all different *casas*, supervise these Court activities with the aid of committees, the members of which are also drawn from the various *casas*.

The problem of helping the new girls adjust themselves and get acquainted in their own living groups is primary, and this is where the sponsors play a large part. Every year one girl who has shown herself to be very capable, and a good mixer, is chosen by a committee to be a sponsor. Before the new girls move in, it is her job to write them all, welcoming them to their particular *casa*. When they arrive she becomes acquainted with all of them as soon as possible and helps them to become acquainted with the others.

An aid in helping the girls from the different *casas* get acquainted is the common dining hall for all of Lagunita. Seating plans for this dining room were well thought out. It was decided, after a careful survey, that round tables which seat eight people were preferable to those which seat six or ten. Table-talk is carried on more easily than at the larger ones, and usually more than six persons desire to eat together.

Student Preference Honored Without Discrimination

Lagunita has adopted a system by which girls may obtain residence in any living groups they wish without any discrimination. Individuals state their preference as to which *casa* they would care to live in and give their alternative choices in order of preference. Numbers are drawn, and those girls with the lowest numbers get their first choice. Of course there are a few who find themselves unable to live where they wish, but if any vacancies occur in the group of their choice during the course of the quarter, they are given the opportunity to move. If there are no vacancies until the end of the quarter, at that time another drawing is held, and very rarely is anyone unhappy with the results. Since the abolition of sororities on this campus, this system has been put into use by all living groups.

This system has not, however, solved the whole situation. Once again it has become apparent, not only to Stanford, but to other universities and colleges, that more dormitories must be built to house the increasing number of college girls. Undoubtedly a number of those dormitories will be under construction before too long, and I sincerely hope that a great many of them will be of the same type as Lagunita.

PLANNING COLLEGE HOME ECONOMICS DEPARTMENTS

Making the Department Homelike

By BESS HEFLIN

Head of Teacher Training Department, University of Texas, Austin

A GRAVE responsibility rests upon college administrators and staffs who are planning home economic departments in this rapidly changing age. What do we want American homes to be like now and in the future? How can we plan space and equipment which will exemplify, in so far as possible, the kinds of homes this great democracy should have? How can the physical plant be made to serve as a "silent teacher" to students and homemakers in all areas of home and family life, and at the same time maintain high efficiency in its technical and research laboratories? These are questions of prime importance in planning a new department or in remodeling an old one.

Department Should Reflect Educational Philosophy

The atmosphere of a home economics department reflects the educational philosophy of those who plan it—both their philosophy of home economics and of general education. If this philosophy includes the belief that the individual learns from his environment as well as from books, lectures, and laboratory exercises, then the home economics plant, equipment, and furnishings will be planned to serve, as far as possible, as a demonstration of the principles and subject matter to be taught. It will also provide for rich experiences that contribute to personal growth and development, to gracious and effective home and community living, and to vocational or professional efficiency of its students.

The home economics department—whether in a high school or in a college, whether in a remodeled or a new building, whether in a separate building or in one shared by other departments—should typify as far as possible the "ideal homelife of today unhampered by traditions of the past" as expressed by Ellen H. Richards, who pioneered in education for home and family life. It should demonstrate to the student body and to homemakers in the locality ways in which economic, technological, and social changes may be adapted and applied to the improvement of standards of living in homes. It should also be helpful in demonstrating greater efficiency in the professions for which home economics trains.

Achieving a Homelike Atmosphere

Location of the Department

The extent to which a homelike atmosphere can be achieved in the home economics department depends somewhat on the location of the department. A separate building has many more possibilities than a department in a building constructed to house various departments. A separate building for home economics may be of an architectural design adaptable to homes of the locality instead of the traditional rectangular classroom building design. It may be built of materials that are indigenous or easily accessible and that are suitable for home building. The landscaping and the flower and vegetable gardens of a separate home economics building, when indigenous plantings are used, may serve as demonstrations to homemakers in the community and provide learning experience for students. In some sections of the country the home



Home Economics Building, University of Texas, Austin. Style of architecture is regional; native plants are used in landscaping



Supper in the patio of the Home Economics Building, University of Texas. Al fresco dining is popular in this southwestern state

economics building provides opportunity for outdoor entertainment that is popular with families and social groups.

Entrance to Department

The entrance to a home economics building or department may set the atmosphere of the entire department. Through an arrangement of furnishings and accessories it may express the warmth, hospitality and feeling of "being lived in" which is desirable in homes; or it may have the cold, austere, impersonal atmosphere too often found in classroom buildings. Artistic arrangements of seasonal flowers, shrub prunings, grasses, and the like are effectively used in many departments to give a homelike atmosphere to the entrance.

Interior Decoration

Offices, classrooms, and laboratories can be pleasant as well as efficient places in which to work. Good color combinations in wall finishes, in venetian blinds, and in draperies perhaps, need not detract from the functional purpose of such rooms and can be illustrations of good interior decoration which may be adapted to the home. Calculating dietaries, analyzing and



One corner of the gracious entrance hall, Home Economics Building, University of Texas. The table decoration of red Nandina berries and foliage from campus shrubs contributes to the warm and hospitable atmosphere here



Low income kitchen, Home Economics Building, University of Texas. The university has unit kitchens and dining rooms at four different income levels

processing foods, and testing textiles and fabrics are likely to be more interesting and functional in a semi-home environment than in a more formal laboratory.

Foods Laboratories, Dining Areas

Unit kitchens in foods laboratories contribute to a homelike environment. In some laboratories unit kitchens are equipped for different income levels, ranging from one simply equipped with locally built cabinets and the least expensive stove and refrigerator to one that has all the latest acceptable modern furnishings and equipment. It is important that each unit set the best home standards in arrangement, in materials used, in heights of working surfaces, and in completeness for its particular income level. Dining areas also should exemplify good home standards in furnishings, linens, china, crystal, and silver within the reach of the average home in the community.

In some college departments the foods laboratories are equipped with unit kitchens on different income levels and the dining rooms are similarly furnished. The University of Texas has unit kitchens and four dining rooms on different income levels. The furniture in the dining room for the lowest income group was built by a carpenter on the campus, and the other furnishings are inexpensive but good in color and design. The light fixture was hammered from cast-off iron gas pipes, the chair seats of raw-hide were locally cured, and the curtains were made of cotton material costing 15 cents a yard from a nearby mill and hand embroidered. The dining room for the highest income



Low income dining room, Home Economics Building, University of Texas. Campus carpenter built the simple but tasteful furniture

group is in Georgian design, and all furnishings are in keeping with that period. The kitchen for this income level is modern in every detail and includes many labor-saving devices.

Clothing Laboratory, Nursery School

It is not difficult to give a clothing laboratory a homelike atmosphere with proper lighting and the use of good color combinations and design in furnishings. Comfortable, good posture-forming equipment is as important here as it is in the home. The layout, equipment, and furnishings of the entire department should serve as teaching aids for the courses in house planning and interior decoration. The nursery or play schools which serve as laboratories in child development should, in their furnishings and equipment, be suggestive of what the home nursery could have.

Durability Need Not Be Sacrificed

A modern home economics department is as vitally concerned with the social development of students as with the development of skills and the acquisition of knowledge. It provides an environment for social experiences which help to develop them as individuals and as future homemakers. Club rooms, reading rooms, relaxation rooms, all may be furnished in keeping with the function of the room and at the same time the furnishings may in quality and design be suitable for home use. Durability need not be sacrificed in securing good lines and proportions and color combinations. Floor coverings, draperies, upholstery or slip covers, lamps, and many small accessories may be used to give such rooms a satisfying homelike atmosphere.

College departments have one or more home management houses—usually on different income levels when there is more than one house. When living in the home management house the students actually operate a home. Home management houses should exemplify the best practicable standards of home living on the income provided and should contribute richly to the personal and social development of the student.

AUTHOR'S NOTE: For a detailed description of the Home Economics Building, University of Texas, see "An Experience in Cooperative Planning" by Mary E. Gearing, *Practical Home Economics*, January, 1935, p. 10. (Since this article was written the tea room has been replaced by food technology laboratories and faculty room. The tea room is now located in an attractive old stone house remodeled for the purpose.)

Planning in Relation to Curriculum

By MILDRED SIPP

Director, Home Economics Department, State Teachers College, Buffalo, New York

WHAT space and equipment shall be included in the college home economics department? The answer to that question involves careful consideration of the curriculum.

Some departments are primarily concerned with teaching non-major students; others, with home economics majors; while still others have offerings for both. A given department may have one chief purpose for its majors, as homemaking or teacher education; other institutions may offer a number of specializations, as institutional management, clothing and textiles, child development, foods and nutrition, and related art. The space and equipment for any college home economics department should be planned to provide for all curricula offered.

Provide for Core Curriculum as Well as Specialization

The study of curriculum requirements for majors will suggest many implications for space and equipment. The department that is offering a specialization in clothing and textiles will need to consider space for a textiles laboratory or special work in costume design or for merchandising or some other major. Nutrition majors will need a place for experimental work in foods and nutrition. Students preparing to become food demonstrators in commercial establishments or educational agencies will need a place in which they can give demonstrations before class or community groups.

The trend in college home economics curricula is to provide some common core of home economics for all majors regardless of specialization. The management of a home is an important responsibility of most women, and the home economics core material provides some preparation for this. It follows that every home economics department, large or small, should plan space and equipment for teaching all phases of home economics which can be used for work with non-majors as well as majors.

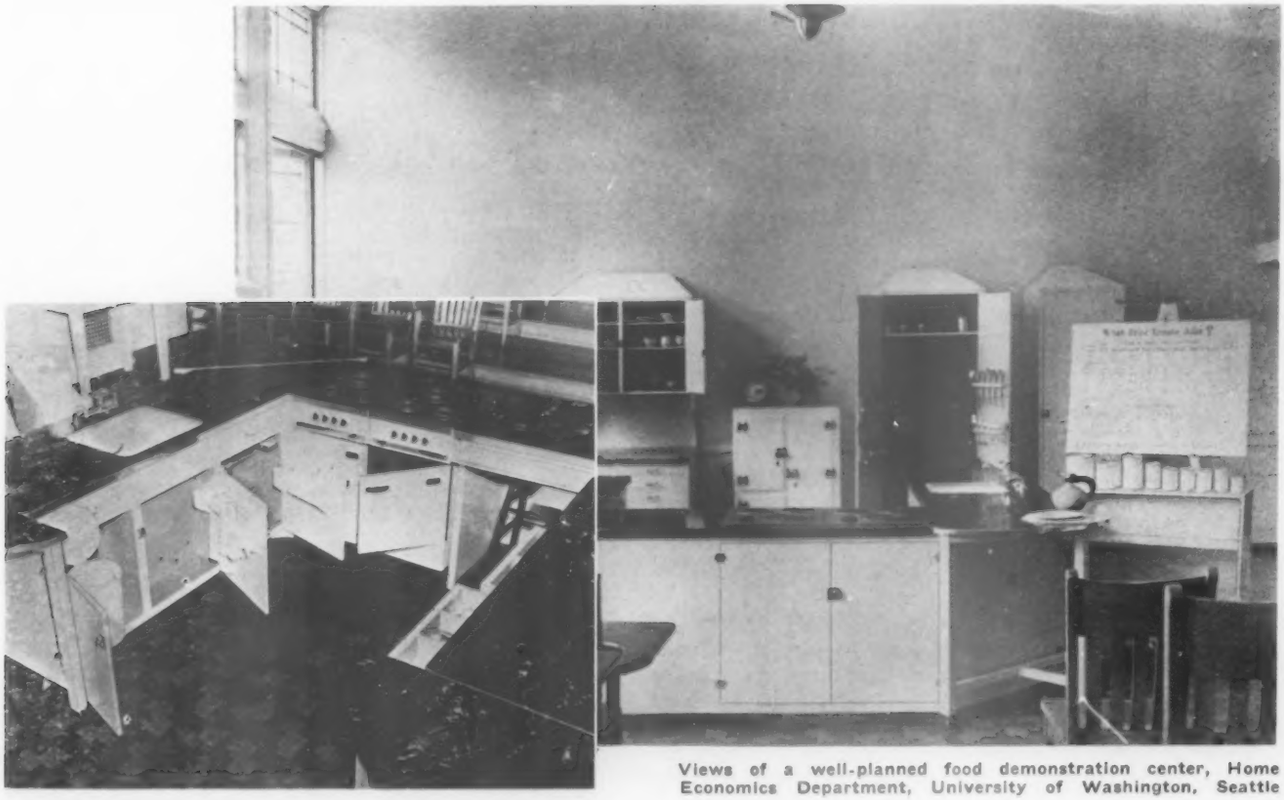
Provide for Community Use of Department

The college which recognizes the needs of homemakers will probably include a living-hospitality center for class use and will locate it adjacent to a food preparation center. It may be a living room and a dining room, or it may be a combination living-dining room. When space is at a premium, careful planning of furnishings, equipment, and storage may make it possible to use such a room for small classes in other fields or for a student lounge.

Home economics departments often render service to the surrounding community as well as to the college, and this may require special plans for space or equipment. Perhaps it is a nutrition course for cadet



Reading room, Home Economics Building, University of Texas. The furnishings are homelike



Views of a well-planned food demonstration center, Home Economics Department, University of Washington, Seattle

nurses, or a school lunch course for elementary teachers. In some colleges much use is made of the home economics department space and equipment for clothing care, repair, and construction by students not in home economics classes. Many departments offer homemakers assistance with their problems—sometimes in clinics or conferences, sometimes through courses. These services may necessitate providing space where different kinds and arrangements of equipment and furnishings may be tried out. Special days for alumnae engaged in teaching or extension work are important contributions to in-service education. Such services merit consideration, and if they seem desirable, space allotments should, of course, be made for them.

Plan for Flexibility in Use

In addition to considering the present curriculum of the college, some thought should be given to possible future offerings. Homes are constantly affected by changing social and economic conditions and by scientific advancement; therefore home economics departments should be planned so that fairly frequent changes are possible which reflect changes in home conditions. If new developments are in the offing, space should be planned for them at once. If, however, the time of a new development seems more remote, adequate space can be included in a home economics department that is reasonably flexible in nature and easily adaptable to change. Planning carefully at the time of building may save large sums of money at a later date.

Graduate work will require additional space and equipment. It will undoubtedly involve research in some or all fields of specialization. The amount and type of space required will vary with the type of research to be done, but good research requires carefully planned space. The graduate program may also require additional laboratories for more advanced work, although necessary equipment for graduate courses may be placed in laboratories used for undergraduate courses.

The Home Economics-Nursery School Building at Winthrop College

By SARAH E. CRAGWALL

Head of Home Economics Department, Winthrop College, Rock Hill, South Carolina

EVERY opportunity was afforded to make the home economics and nursery school building of Winthrop College what a home economist would want for her work. The college administrators asked the home economics department to take care of working out the plans and supervising the building and the selection of equipment. They also had the wisdom to assign the department an interested and cooperative architect. The knowledge of the home economics faculty and the architect in their respective fields combined to make the building better than it would have been if the two had not worked together.

Philosophy Underlying the Planning

The philosophy underlying the planning which has made the building a joy to work in and a beautiful place for work is: *A building in which homemaking is to be taught should be the embodiment of the best in gracious home living.*

With this philosophy in mind, the architect tried in every way to make the building homelike. The halls were broken in the center to avoid an institutional atmosphere; cornices and wainscoting such as are found in the Colonial homes of the South were used; the exterior of the building adhered to the Southern Colonial architecture of the other buildings on the campus. Details such as a pineapple finial in the broken pediment over the front entrance, which represents hospitality, and the lovely stairway in the front entrance hall further carried out the impression of a home.

Flexibility in the Structure

To make provision for changes in the building, because of modifications in our home concepts and consequently in our homemaking, the framework was planned to support the weight of the building without having to rely on room partitions. Thus, partitions can be moved, if it seems advisable to do so, without endangering the safety of the building.

To take care of future expansion, the end halls of the wings were planned so that another building of the same size can be added, or wings of various sizes can be extended. Expansion within the building itself was also anticipated. New courses and majors can be added. A study of the plan shows some of the possibilities.

Arrangement, Decoration, and Furnishings

The placement and grouping of rooms according to use in the class and out-of-class activities were given great care. The objectives were the same as those of the modern American home—comfort, convenience, and beauty. The use of the building itself as a teaching device for homemaking received emphasis also. Wall finishes, floor finishes, lighting fixtures, and



Above—Winthrop College, Home Economics-Nursery School Building, showing the curved entrance stairway, the pillars of the porch, and the doorway with the broken pediment above and the pineapple finial betokening hospitality

building materials were chosen for variety and for beauty in relation to the purpose of the rooms, with the expectation of using them in teaching.

On each floor the offices are grouped in the center of the building, away from the classrooms and laboratories. This was done for three reasons: (1) to provide privacy for the teachers; (2) to make it possible to use one telephone on a floor; and (3) to make the broken center or area serve as a reception room, lobby, or waiting room for all faculty on that floor. A sufficient number of offices were provided for each staff member to have one to herself. Every office has facilities for wrap storage and book storage.

Care was taken to provide sufficient storage for each unit on a floor, and the placement of the storage space has made it especially useful. Moreover, not only is the storage space unusually liberal, but each



Above—Indentation in the center of the hall on the fourth floor. This space is used as a home living unit, as a lobby or waiting room for offices on the right, or as a reception room for the dining room which is entered through the door shown on the left



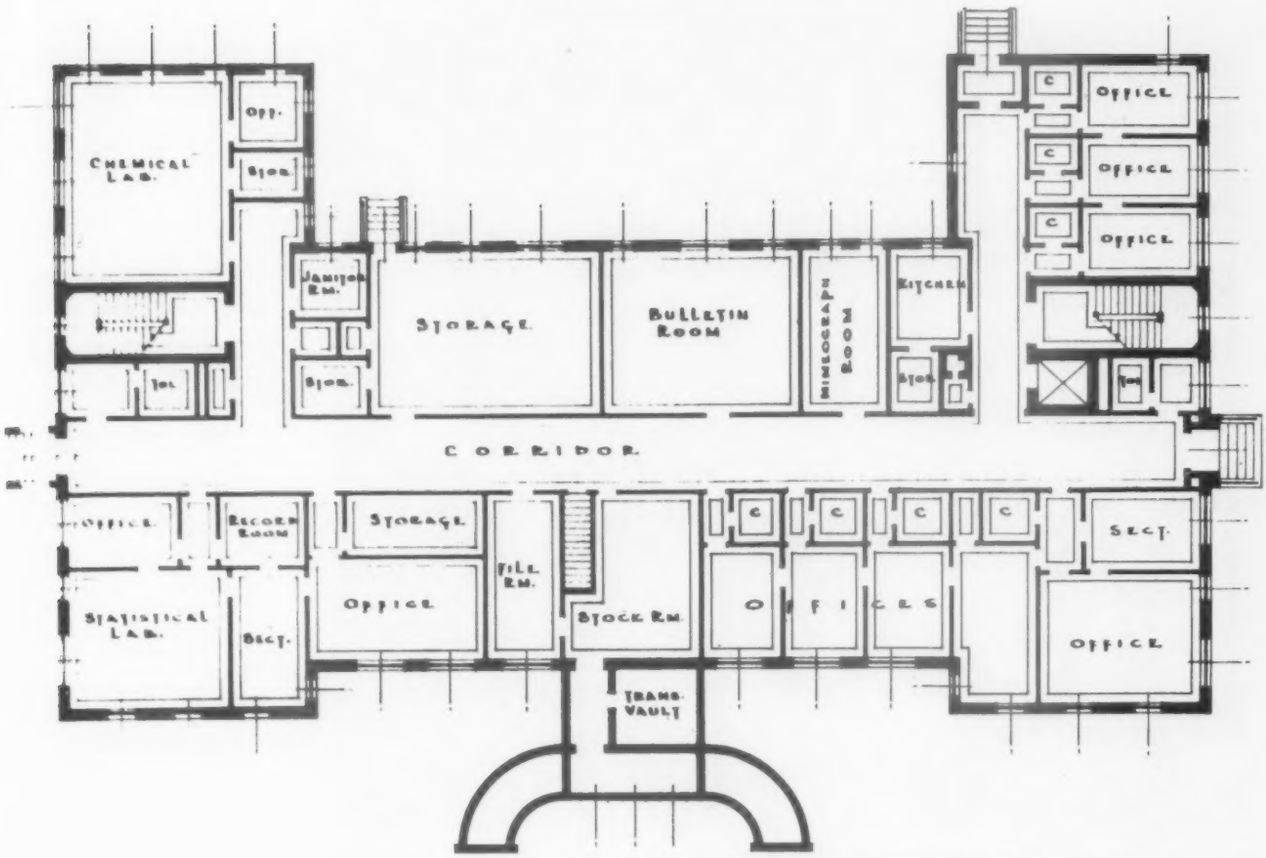
Left—Main entrance on second floor and main stairway to the third floor. Decorating and furnishings are in Southern Colonial tradition



Office on the second floor. Note the homelike atmosphere. Files are furred in; doors conceal them



Faculty conference room on second floor. Home furnishings, used everywhere in the building, serve as examples to classes in interior decorating



Hopkins and Baker, Architects; A. D. Gilchrist, Associate Architect

First floor plan of the Home Economics Building, Winthrop College. This floor houses the home demonstration and home economics research divisions. Exit on the left leads to nursery school

storage unit was planned for the particular type of work with which it was associated.

In decorating, the traditional Southern Colonial style was adhered to, except in some rooms in which modern design was particularly suitable. Cornices, wall paneling, or papering, and types and kinds of flooring, were carefully planned. Color schemes in floors, walls, and ceilings were decided according to purpose, orientation, and beauty, with much variety achieved. It was practical to use paint, paper, and wood as in the homes of the region since there is not much dirt and soot to contend with in the small Southern city in which Winthrop College is located.

A general color scheme for the whole building, and special color schemes for individual rooms, was worked out. Furniture, upholstery, and draperies were chosen according to the color schemes decided on for each room.

Home-type furniture was used, even to refectory tables with pull-out extension leaves for the clothing laboratories and to regular built-in home kitchen units for the foods laboratories. Tablet arm chairs based on a spindle-back Windsor chair were installed in the classrooms, and the same chair without the tablet arm in the laboratories with tables. All offices and other rooms of the building—such as the reception room, library, faculty conference room, and dining room—were outfitted with home furniture and finishes that make it possible to use these in teaching home furnishing classes.

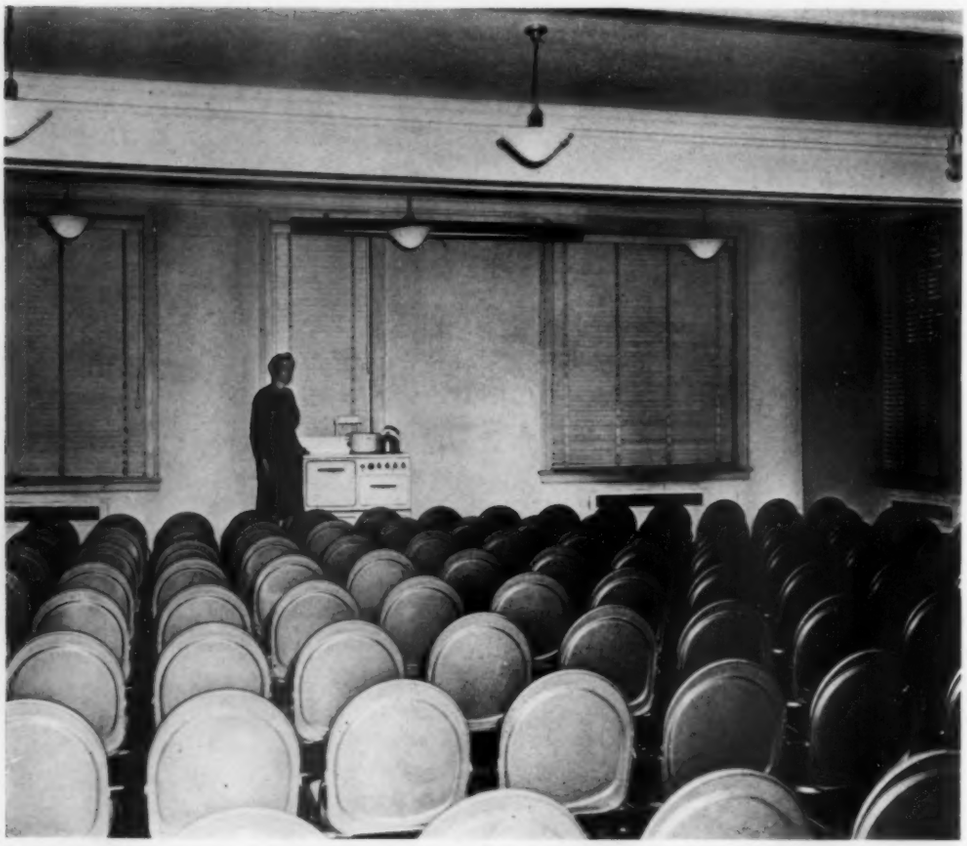
Special Features of Home Economics Department

The first floor of the building is given over entirely to the home demonstration and home economics research divisions. Each of these groups planned the space allotted to them. The home economics faculty of the college planned the building starting with the second or main floor.

Second Floor

The large reception room is divided by accordion-type leather folding doors. These doors, soundproof as any folding doors can be, are attractive and do not detract from the beauty of the room. Since the room is used for talks and demonstrations, blackboard and bulletin boards were installed. The blackboard is recessed in the wall, with bulletin board space on the inside of the doors which close over the blackboard. This arrangement, which has the effect of a small cabinet in the wall, was put in each of the two rooms.

A kitchenette and serving room adjoins the reception room which is used for banquets and receptions as well as a variety of other purposes. A long cable may be plugged into the wall so that the stove, which is on a platform with rollers, can be rolled into the

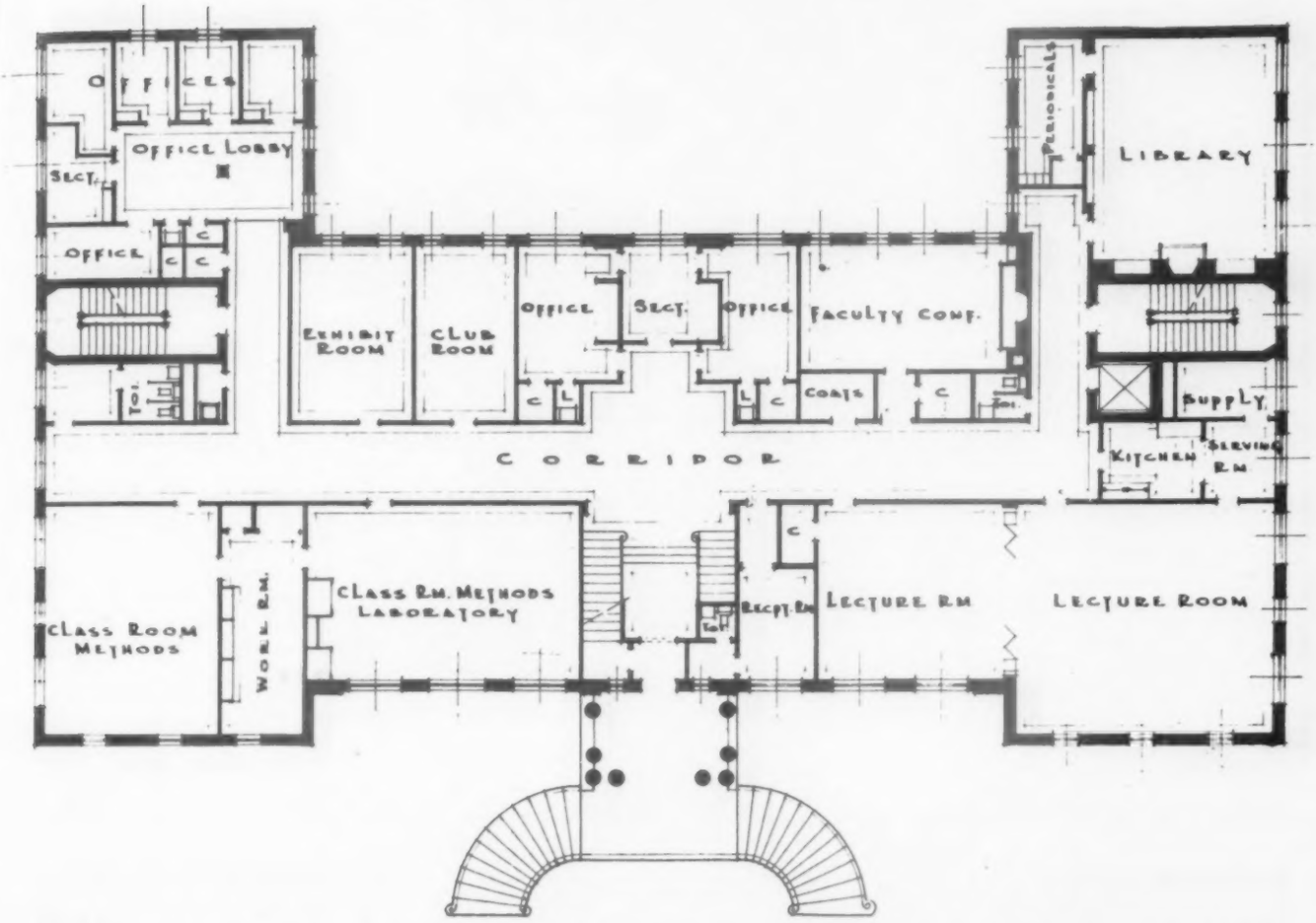


The auditorium end of the reception room on the second floor. The stove is rolled out for a demonstration and lecture. The room is also used for showing movies (see screen)



The reception room on the second floor of the Home Economics Building, Winthrop College. Note the accordion-type leather folding partition which divides the reception room into two rooms

The auditorium end of the room can be seen through the opening in the partition (see illustration above). Blackboard and bulletin board space in this room is cleverly hidden when it is not needed



Second floor plan (main floor) of the Home Economics Building. Here are the main office and the library; rooms for teacher-training and faculty conferences, rooms for entertainment, banquets, demonstrations; and a club room for Phi Upsilon Omicron

reception room for demonstrations. A platform, the height of the roller-base of the stove, is available for use with it.

The reception room can be darkened for showings of motion pictures and slides. It seemed to be the best place for this purpose because of its availability at all times.

To preserve the homelike atmosphere in the offices, the space for the files was furred in. With doors across, the files are out of sight. Thus, they do not detract from the desired effect and yet are at hand for ready use.

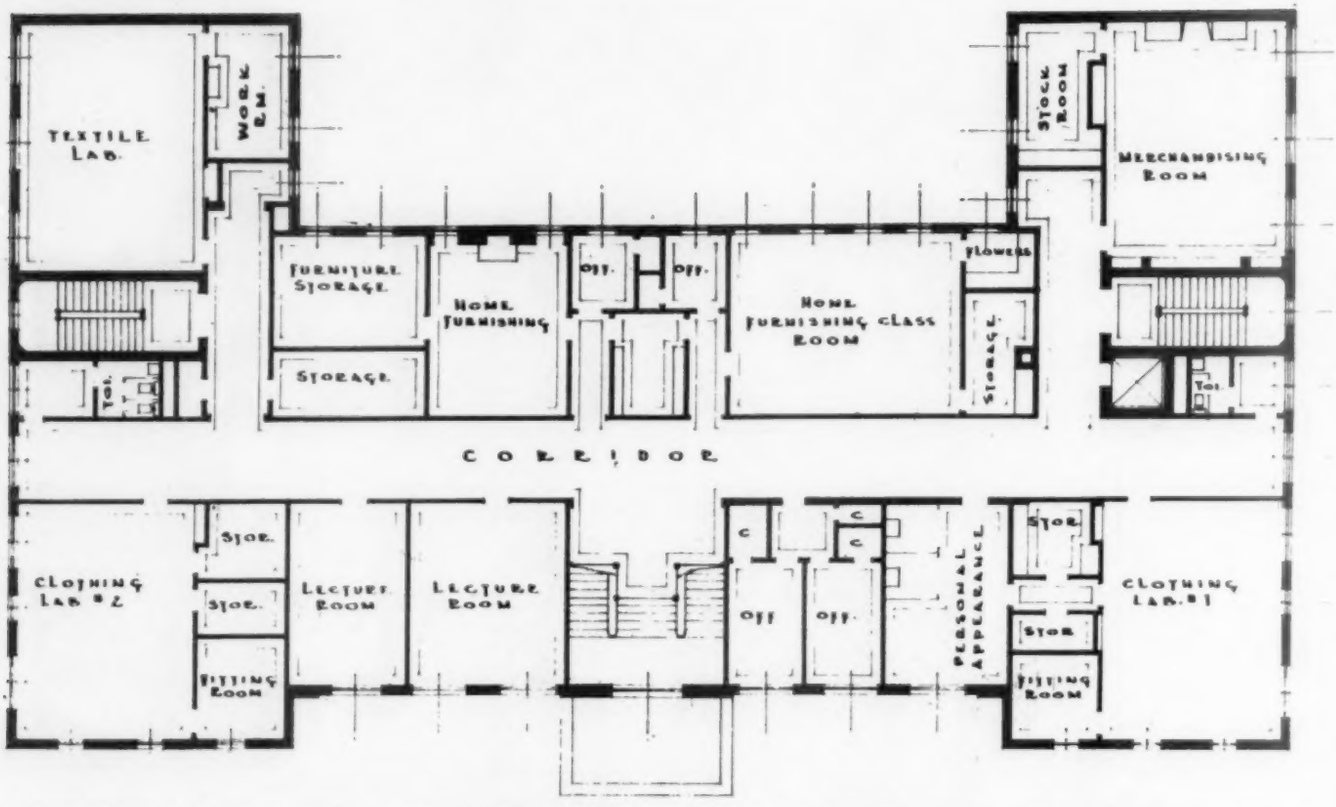
A workroom between the teacher-training recitation room and laboratory is equipped with storage space specifically planned for the needs of these rooms.

Third Floor

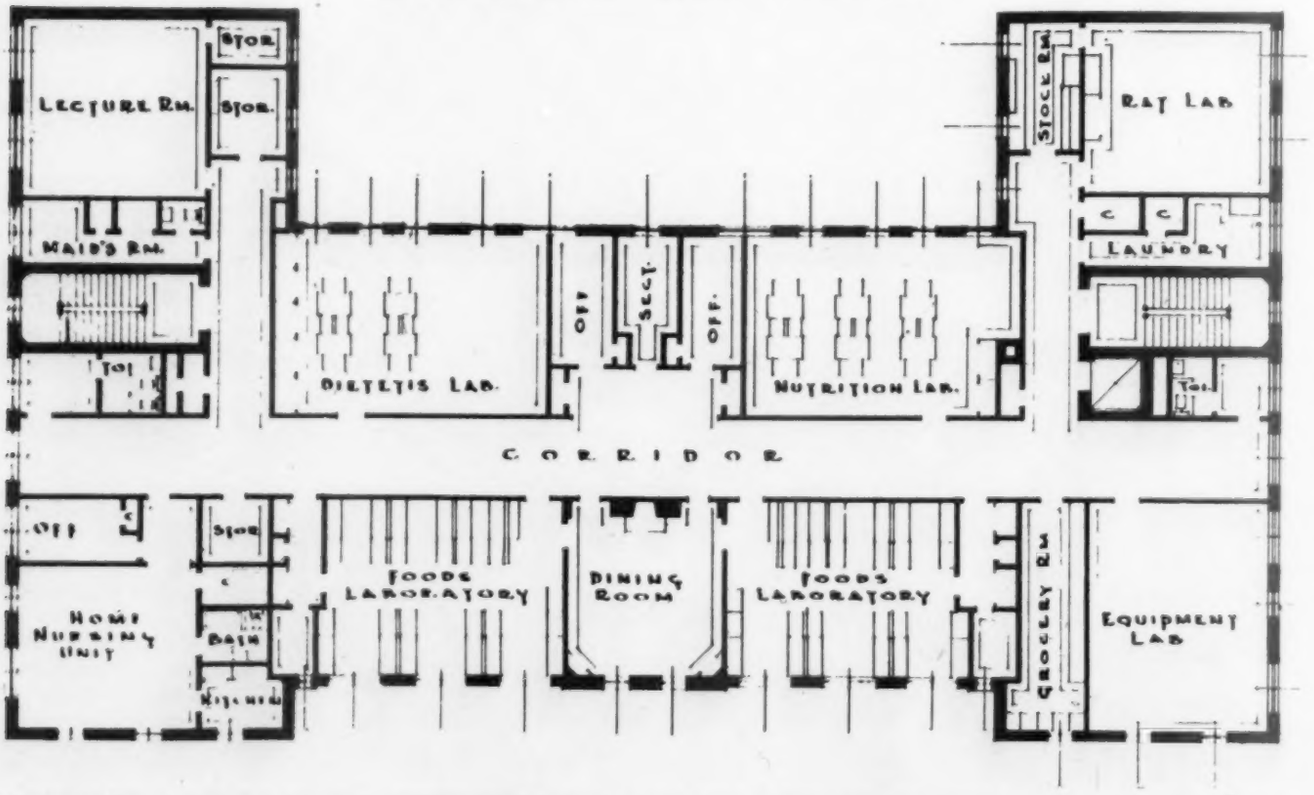
A laboratory in the home furnishings section is equipped with shades to darken the room, a screen, and a slide machine. The storage space consists of a large storage closet with various kinds of shelves and other specially planned arrangements for storing illustrative material used in home furnishings and house planning work. There is also a special room for arranging flowers. This has a counter covered with linoleum in which there is a sink with a goose-neck faucet for filling vases. Additional shelves are built up the walls for storing vases and flower holders. A room with swinging panels to give different backgrounds is connected with this unit. This is used for trying out furniture arrangements. Beyond this is a large storage and workroom for doing over furniture; painting, sanding, waxing, upholstering, etc. The shelves in this workroom are designed to take care of materials necessary in refinishing furniture and for storing large canvas rolls to be used on the swinging panels in the arrangement room.

The clothing laboratories, of which there are three, are each set up for a different purpose, and the storage space is arranged accordingly. One laboratory for clothing construction and personal grooming adjoins a fully-equipped beauty parlor. There is a storage room for the beauty supplies and a large storage room for illustrative material for clothing and storage of garments under construction. The second laboratory is for designing and has storage space for dress forms in addition to storage space for illustrative material and garments under construction. The third laboratory, for textile work, has plumbing fixtures ready for a textile chemistry table. The connecting storage room is planned for storing materials used in the study of textiles.

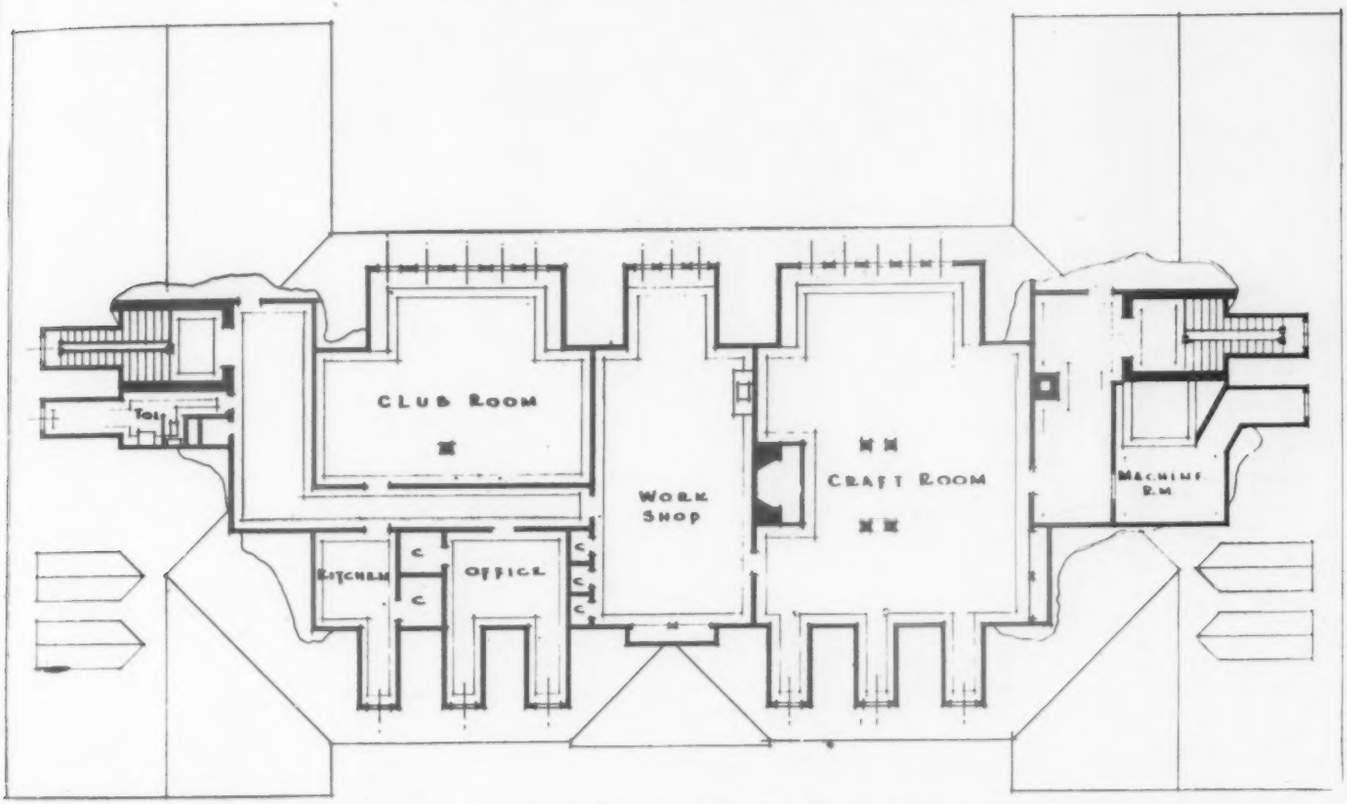
A merchandising room, with various types of fixtures for display and a large storage room for ma-



Third floor plan, Home Economics Building, Winthrop College. On this floor is done all work in textiles, clothing, personal grooming, merchandising, home furnishing, and house planning



The fourth floor of the Home Economics Building includes facilities for work in foods, nutrition, household economics and equipment, laundry, food preservation, home nursing, and home management



The fifth floor of the Home Economics Building, Winthrop College, includes space for arts and crafts, a club room for the general home economics clubs, and a kitchenette for the use of students

terials used, has been set up in connection with the clothing work.

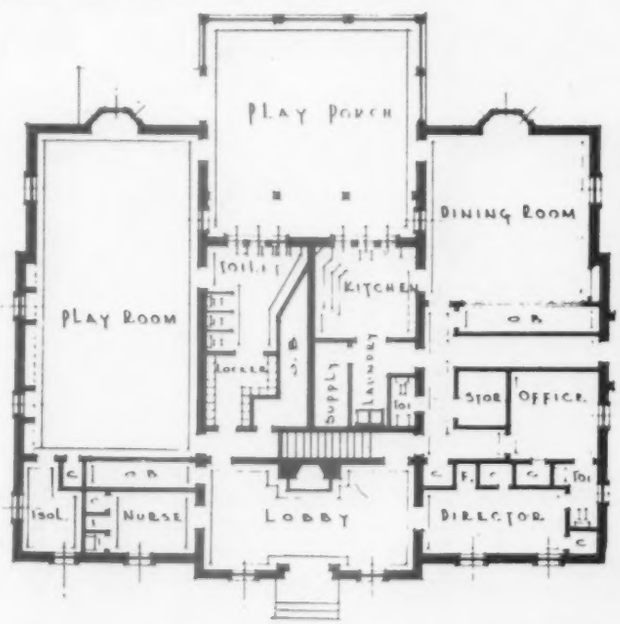
The Fourth Floor

The fourth floor was planned for home management, foods, and nutrition. The storage space has been worked out specifically for these phases of homemaking. There is a large grocery storage and supply room for the use of all laboratories. Each foods laboratory has its own wrap storage and pantry. The equipment laboratory has several power outlets as well as a large number of regular plug-in outlets with a shelf in front for working with small equipment. The dining room has corner cupboards for china and crystal, and in the hall outside there are two closets especially designed for the storage of china and additional crystal and linen.

There is an apartment on this floor equipped for a great many purposes. It has been used as a home nursing laboratory, for parties and dinners, and as a home management apartment. In addition to the storage space already mentioned, there are three storage closets off the hall in various places. They have proved to be useful for storage of illustrative material and little-used supplies.

The Fifth Floor

The fifth floor is set up for arts and crafts work. Since it is just under the roof, it has been possible to utilize space for storage which might otherwise have been lost. The large arts and crafts room has a great deal of storage space built in under the roof at one end. The same thing is true of the workroom.

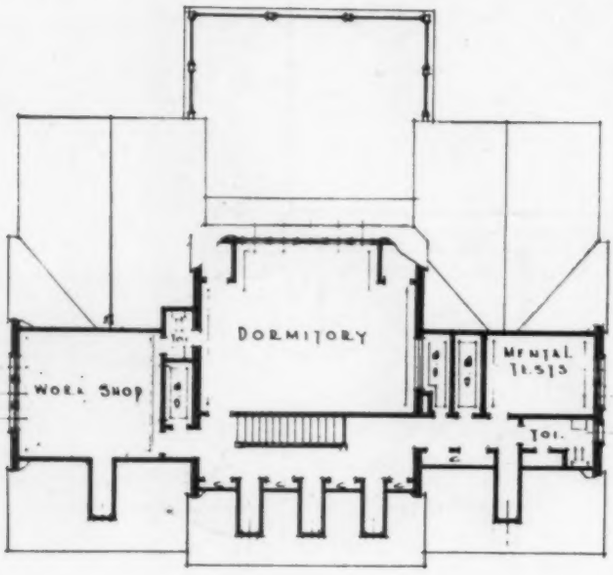


First floor plan of the nursery school, Winthrop College. Every room has an observation booth with one-way vision screen. Here too, furnishings are Colonial and homelike

The office, the kitchenette, and the club room also have large storage areas.

Nursery School

The nursery school was planned as a Williamsburg type of house, both as to exterior and interior. Here,



Second floor plan, the nursery school part of the Home Economics Building, Winthrop College. The three rooms can be used for sleeping, making it possible to accommodate more children than would be the case if there were only one large room

again, care was given to selecting color schemes and furniture in keeping with the Southern Colonial home.

Every room in which an activity takes place has an observation booth with a one-way vision screen. This is true even in the locker room and toilet room. The sleeping space is on the second floor. Three rooms on this floor can be used for sleeping, making it possible to take care of the children more adequately than would be the case if there were only one large sleeping room.

Storage space has been given much thought, and a great deal of space which might have been lost has been used for storage.

Improvements That Seem Advisable

The faculty and the students have found the home economics-nursery school building satisfactory as it is, but during the five years of its use a number of things have been noted that could be improved. A few of them are:

1. Several dining rooms, some small and some large.
2. Better lighting in many of the rooms, particularly the library, faculty conference room, and main offices.
3. More shelves in the library.
4. A better floor in the reception room. The parquet floor of beech laid in mastic has proved to be most unsatisfactory as it swells and bucks up in damp weather in spite of the fact that it is on the second floor and not the ground floor.



The type of lunch to be served and number of pupils to be served at one time must be predetermined

PLANNING THE SCHOOL LUNCHROOM

By MARGARET M. MORRIS

School Lunch Division, United States Department of Agriculture, Washington, D. C.

TODAY a school lunch program is widely accepted as a part of a functioning educational system. More and more, school administrators are taking advantage of the opportunities for learning that are available in a well-planned and well-supervised school lunch organization. They see it as education for living in its broadest sense and are exploring ways to derive the most value from it.

The school lunch program has become the focal point for the development of good health habits in many American schools. The school cafeteria fits into the educational scheme to provide meals which apply the theories of health and nutrition learned in the classroom.

If the school lunch program is to take its rightful place in the school program, careful thought needs to be given to its development. There must be objectives for the lunch program just as there are for any subject that is taught in the school, and there must be money in the budget for it as well.

Planning Requires Pre-Planning Discussions

All schools cannot have a new plant next year to provide space for an up-to-date school cafeteria, but certain steps can be taken now toward developing such plans. A new wing may be the place selected for the lunchroom, or a separate building may be constructed for it on the school grounds. Or, as many school boards have decided, a classroom or two may be converted to this new use. Remodeling of the present lunchroom is also in the offing for many schools in order to provide more adequate facilities.

Planning a lunchroom that will be functional takes the combined abilities of a food service manager and an architect—neither can do the job alone. If careful plans are made prior to construction, there is more chance of eliminating extra costs caused by later remodeling of inefficient units.

Long before an architect's plan can be drafted for a school lunchroom, many decisions must be made by the school administration. The type of lunch served, the means of paying for the lunch, and the policies governing participation of pupils in the program will affect the kind of lunchroom to be designed. Are students required to stay in the building at noon? What is the length of the lunch period? The answers to these questions will be determining factors in the total number to be served and the number to be

served at one time. In turn, these answers will help in arriving at the amount of space needed for the kitchen and dining room. If a complete lunch is to be offered to all students—and that is the national trend—the equipment needed will be different from that for a soup, sandwich, and/or dessert lunch.

Another subject for pre-planning discussion is whether or not the dining room is to be used for more than food service. Is it to be a study hall, music room, library, or club-activities room as well? This decision will affect the size, the relation of the room to the serving counter, and the kind of furnishings to be selected.

Minimum Requirements Can Be Met

School lunch program planning is long-range planning. No school administrator should feel dejected if he is unable to have a completely equipped lunchroom in a short time. As a beginning, minimum requirements can be met. Improvement can be made from year to year if the original plan provides for expansion.

Health and Sanitation

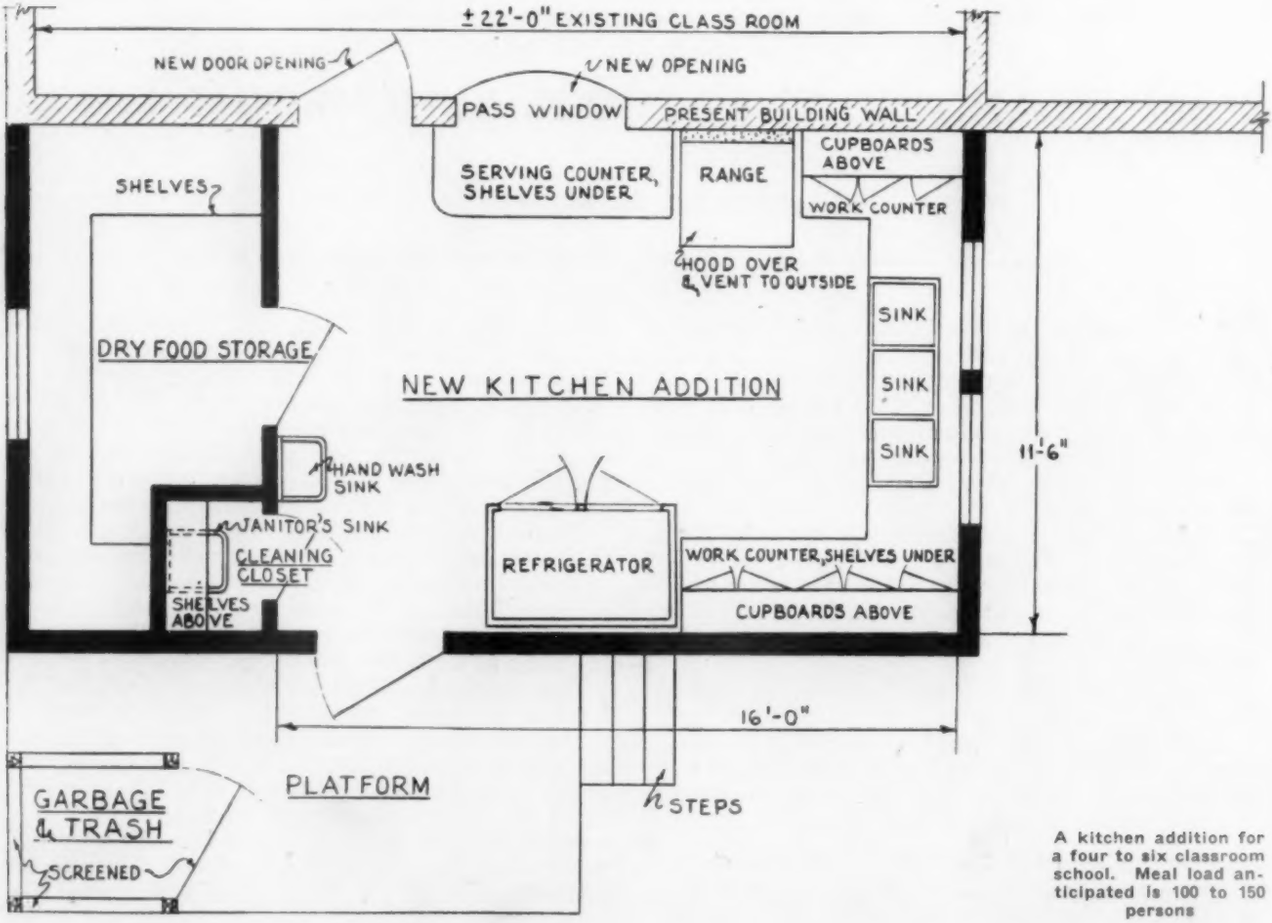
Safeguards to health and sanitation are basic to school lunchroom planning. This means that ease of cleaning must be a consideration in the selection of surface finishes for the walls, floors, and equipment, and in the installation of equipment. It means that in the original construction attention must be given to protection from rodents and insects. Proper ventilation, heat, and lighting are essential in all of the units connected with the school lunchroom. Publications of the U. S. Public Health Service and those of state departments of health should be consulted for information relative to standards and regulations.

Relationships of Areas

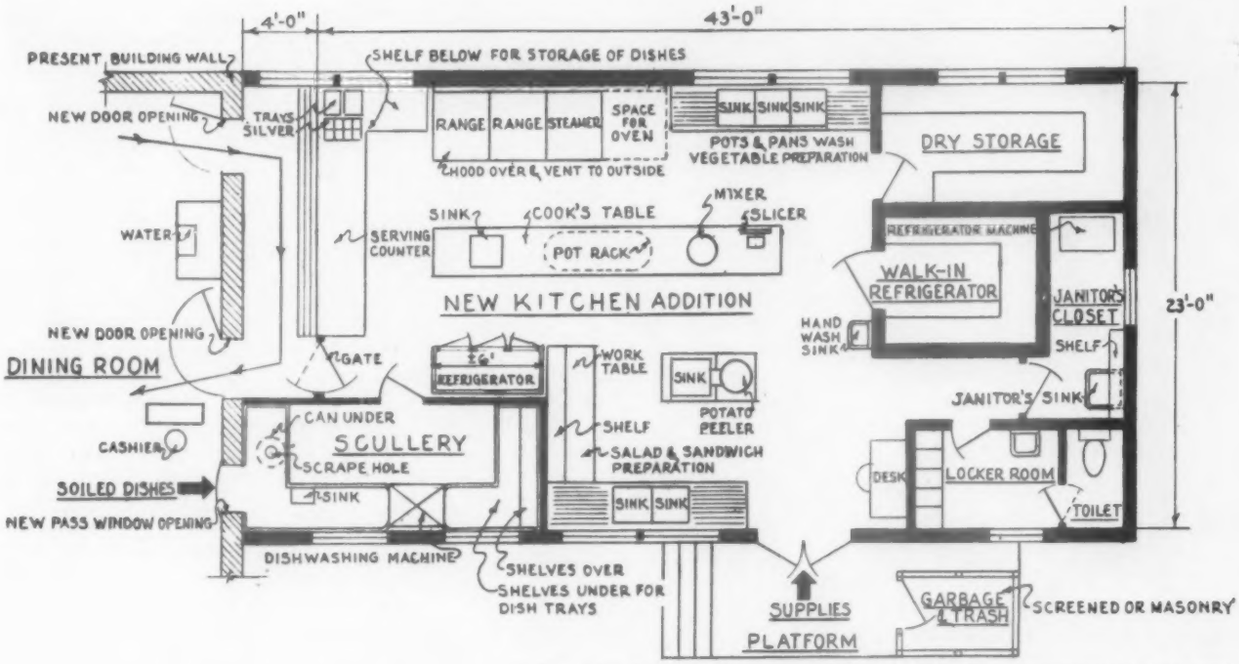
As the layout for the kitchen and dining area is made, it should be checked again and again to be certain that it will be economical of time and motion. In general this means that storage, working, and serving areas must be closely related to allow for orderly sequence of work, with a minimum crossing of paths by workers. It should be such that good supervision is possible.

Storage Space

The location of the food service rooms in a school building is of prime importance. Ideally, they are on the first floor with an outside entrance or very near to one, so that deliveries of food are facilitated. For a large program, a loading platform or other similar place is necessary for receiving food. It is a



A kitchen addition for a four to six classroom school. Meal load anticipated is 100 to 150 persons



Floor plans by Erwin Adelberger and Ivon Blackman, U. S. Department of Agriculture

This plan of a kitchen addition, for a fourteen to twenty classroom school, provides ample safeguards for health and sanitation, which are basic considerations in lunchroom planning. Meal load anticipated is 350 to 500 persons. Note: where building wall behind the range is built of combustible material, provide non-combustible insulation. This applies as well to the plan on the page facing



Dining area from the kitchen. Note storage of plates under counter. Sliding partitions close off kitchen when dining area is used for other purposes

great time saver to have a protected space here that can be used for unpacking crates and other containers and for holding them until disposal.

During the war years one of the worst sore spots in school lunchrooms was insufficient storage room. Of course, the amount needed is related to the frequency of deliveries. The savings that come from large quantity buying must be considered. Some managers have said that, at the minimum, space must be sufficient to store the food needs of the program for one week. If the school and community produce and preserve food, a larger storage space will be needed. In addition to the food storage, there needs to be provision made for cleaning supplies, paper goods, extra dishes, utensils, and parts for equipment.

Storage space must be planned for and not added as an afterthought. It is one of the areas of work in the lunchroom organization and must be located and constructed so as to be functional. It must be convenient to the kitchen and to the receiving platform, but not in the kitchen itself. It must be well lighted, ventilated, and easily cleaned.

Let us consider food storage room first. For canned foods, staples, and root vegetables a room is needed which is free from heat and water pipes and other undesirable structural features. If pipes and ducts are present overhead, a ceiling may be furred to cover them. Motors and compressors should not be housed in the food storage space. Protection from extreme temperatures is important in the keeping of food, and ventilation either by louvers or mechanical means is a necessity. The construction should be such as to render the store room rodent-proof. Another detail to consider in drawing the plan is locating the door or doors to the store room so that they can be controlled, as there is always danger of theft. Protection must be provided through having entrances visible from the kitchen if the lunch program is not large enough to have a separate store room clerk.

In addition to dry storage, adequate refrigeration must be provided. By and large, school lunch programs have been poorly equipped to handle the quantities of milk and other dairy products, meats, fresh fruits and vegetables which are emphasized in nutritionally balanced meals for growing children. The best way to determine the cubic feet of refrigeration needed is to measure the size of the milk cases, the crates of fruits and vegetables, the quantity of eggs, meat and butter that will be used to cover the meal load. The total amount of refrigeration will be determined by the frequency of deliveries. When the total cubic footage is calculated, the next problem is how to divide this up between "walk-in" and "reach-in" units. When at least sixty cubic feet of refrigeration is needed, it is usually less expensive and more satisfactory to use a 6′ x 8′ walk-in refrigerator. For example, to serve 250 to 350 lunches, a 6′ x 8′ walk-in, plus a 20 cubic foot reach-in near the counter, would be optimum. If much frozen food is used, a holding cabinet may be needed.

Since there is danger of poisoning if insecticides and cleaning supplies are near food, it is imperative that separate storage be provided. Sometimes a closed cupboard for these supplies can be built within the closet which holds the slop sink, or a cupboard in the school janitor's room might be used. Small daily supplies can be kept in the dishwashing unit where they will not get into food. Mops, brooms and buckets must have ventilated space.

Food Preparation Units

In the past, school lunchrooms served "light lunches," but with the trend toward the complete meal there is greater use of fresh vegetables. This feature means provision for more space for preliminary preparation of vegetables—sorting, washing, trimming, cutting, and peeling them, and for placing hampers and crates when they are brought into the kitchen. There must be space for two 24″ sinks with 27″ drainboards for washing leafy vegetables and a hardwood cutting surface. In cafeterias serving 300 or more, a mechanical peeler makes for efficiency. The peeler must be adjacent to one of the vegetable sinks or have one of its own. The "pre-prep" unit should be located near the food entrance to the kitchen and the storage room and on a direct route to the salad and cooking units.

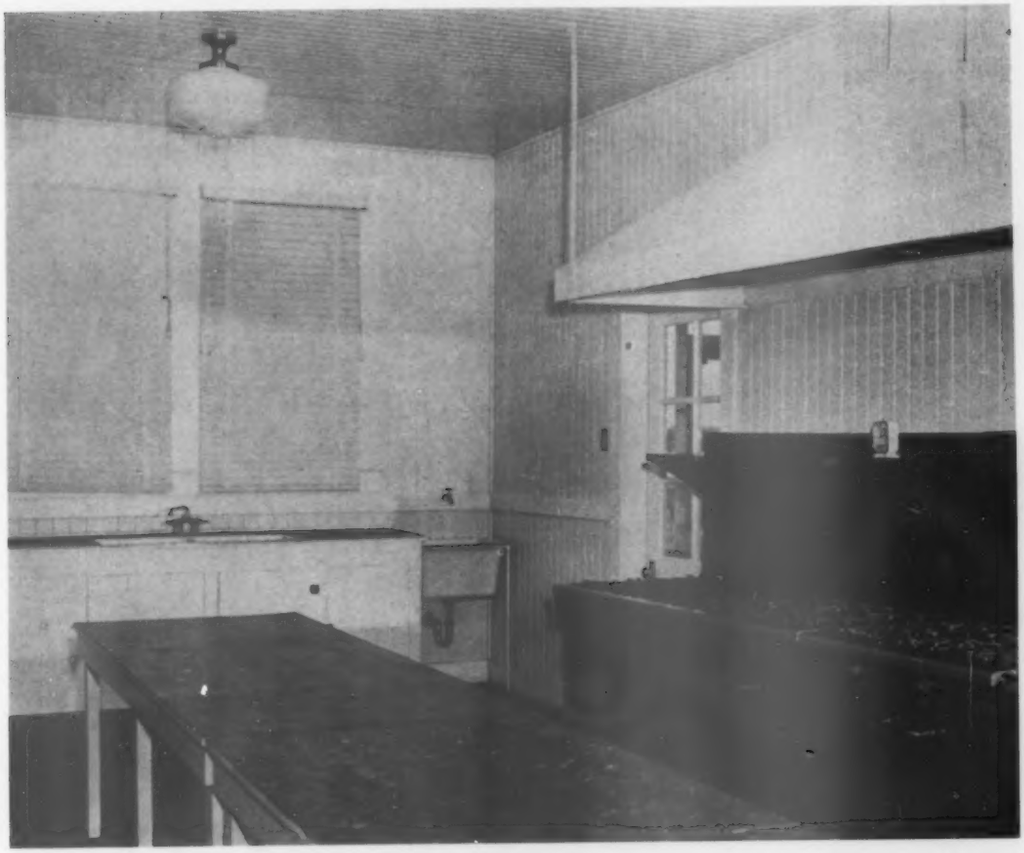
For the most part, fabricated meat cuts are used in the school lunch. If much cutting of meat is done, however, or if chickens are dressed, a sink and solid table surface must be provided for these processes.

Although a meal need not be a hot one or of cooked foods in order to be nutritious, people are generally in agreement that a combination of textures resulting from both raw and cooked foods in a meal is more interesting. Psychologically as well as physiologically, there is a basis for the inclusion of hot food, so one of the important units in a lunchroom is the one which handles the cooking. The range is usually the focal point of the lunch. Lunchrooms serving 75 or more need heavy duty institutional ranges with ovens underneath, which can be obtained in sections according to the number to be served. If no more than 50 to 75 are served, a light-weight, small institutional range will carry the load.

Many managers like to supplement their top-stove cookery with a steamer or steam-jacketed kettle. The facilities for generating steam, if the kettle is contemplated, must be investigated before purchasing.

The location of the cooking unit should be near the serving unit, or at least where passage between the two units can be easily made. Table surface, preferably of metal, should be provided in front of the range or next to it with pot and pan storage either as a hanging rack or shelves below the table. In large units a movable set of shelves or truck might be used for storing pots and pans. Within the cooking unit, mixers, cutters, and slicers should be placed for ease of use. If possible, a small sink should be provided for the cooking unit, especially in large kitchens. When separate facilities for washing pots and pans are provided, they are located within this unit.

A change is occurring in school lunch food preparation with more accent on vegetable preparation and less on baked desserts such as pies and cakes. Instead of taking a complete institutional baking unit for granted in a school cafeteria, careful consideration should be given to the load that will be carried in the "bakery goods line." For the making of gingerbread, muffins, cornbread, plain cakes, and fruit cobblers, there will need to be sufficient work table space available at the time of use. The table, the bins for supplies, and the space for small equipment and uten-

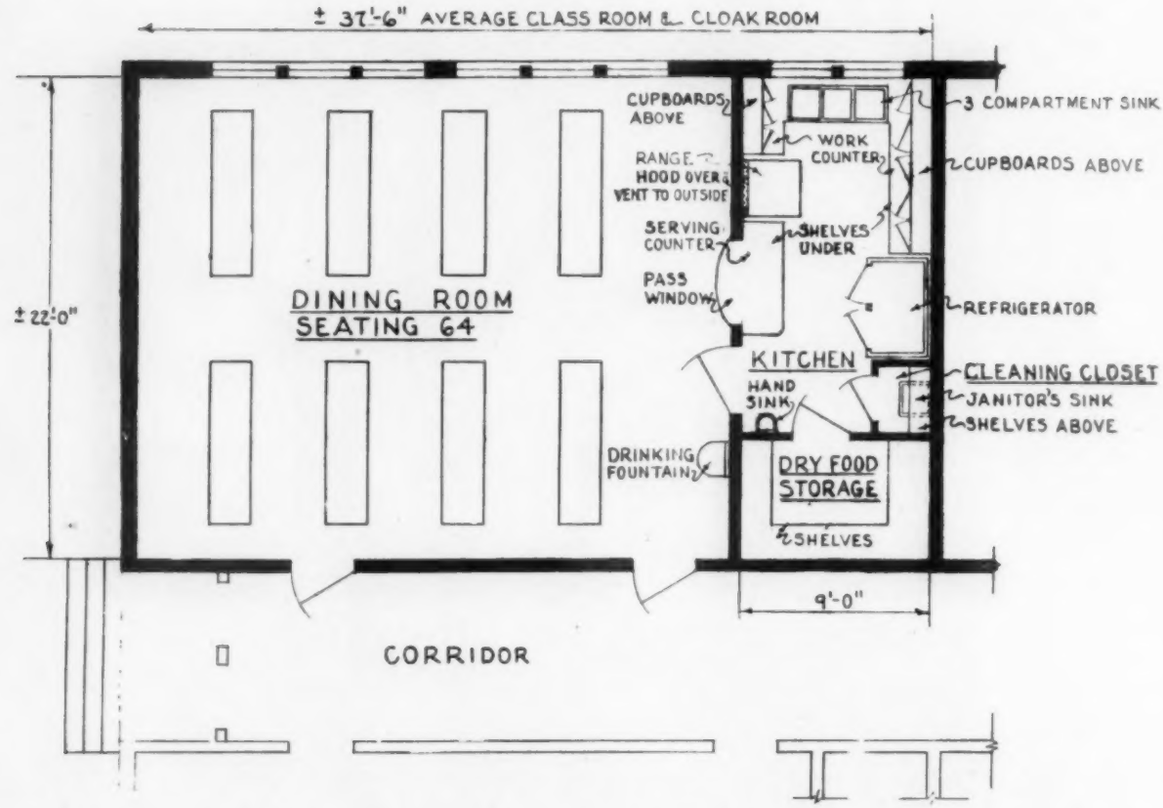


Plan of this kitchen area permits efficient operation. Hot foods and vegetables are prepared here. Small sink is used for pot and pan washing; large sink for vegetable washing. Table services all preparation

U. S. D. A. photograph by Knell



School lunch program at Moncure School, Moncure, Chatham County, North Carolina. A wholesome, appealing lunch served at five cents consisted of cheese, fresh snap beans, creamed potatoes, corn bread, butter, peanut butter cookies, apple and milk



Plan of a classroom converted to a kitchen and dining room, in a four to six classroom school. The meal load is 100 to 150. Note: trash and garbage should be removed from the kitchen daily and held in covered metal containers until disposed of. Provide non-combustible insulation behind the range

sils used for baking must be planned for and located in convenient relation to the oven. Small programs will find the oven in the range adequate if the menus do not include hot breads and casserole dishes in the same meal. When more than 150 are served, it is usually wise to consider the addition of stack ovens if baking is a daily process.

Another work area which needs to be planned for is that in which fruits and vegetables are prepared for salads and desserts. Sandwiches which are only occasional items in complete meal service may also be made in this set-up. A table with hardwood top for cutting and slicing and with drawer or other space for tools is a necessity. Easy access to serving counter, refrigerator, and sink is important.

Food Service

All of the activities connected with the food preparation should be so related that the result will be a satisfying, wholesome lunch which will appeal to the students. Thus the preparation and serving of food are closely associated. In order to have the food served at its proper temperature, the counter must be located and arranged for convenience to workers in the kitchen and to students coming into the dining room. A counter which is part of the kitchen and can be closed off by a sliding partition is the most serviceable from all angles, including multiple use.

A short counter, no more than 10 feet in length, permits expeditious serving in the school lunchroom where a single type lunch is served with limited choice of vegetables or the main dish. In a small lunchroom, no steam or hot units are necessary if plates are dished up directly from the range placed near one end of the counter. In larger operations where the preparation units are farther removed from the serving, it may be necessary to have cooled as well as heated areas in the counter. Only when frequency of service as a part of the meal justifies it, should there be counter space given to a special cabinet for ice cream. Many schools sell ice cream and candy in the dining room after the children have finished their lunch.

A glass plate in front of the serving counter to protect food from the germs emanating from the breaths of those in line is required by law in some states. It may be placed several inches above the top of the counter to allow space for handing plates of food between the counter and the glass plate. In some small cafeterias the students pick up their trays, napkins, and silverware from a table and are handed their plate lunches from a window type opening. Just beyond the counter, space for the checker is needed.

Dining Room Space

In the original planning of the dining room, thought should be given to the entrances and exits. There will be certain regulations to observe in regard to fire and safety; but in addition, smoothness of service is a prime requisite to be considered in a cafeteria. The entrance should be near the serving counter, and an exit should be convenient to the soiled dish window. Within the dining room or near the entrance, shelves

U. S. D. A. photograph by Knell



Lunchroom supervisor is filling plates to be pushed through the opening in front to the receiving line

From Look, America's family magazine



This Chicago school feeds a complete noon meal to 1,500 students daily, planned around seasonally abundant foods in the region; 749 other Chicago schools serve identical lunches



Left—A far cry from the inadequate hand sink method of washing dishes in the old lunch room, this mechanically equipped dishwashing room is so efficiently arranged that the job is practically pleasant

Below—A teacher of food service in cafeteria and restaurant checks school lunch menus for the week

U. S. D. A. photographs by Madeleine Osborne



for books and some arrangement for hanging wraps are essential if students come to the lunchroom with these items.

In planning the dining room space, 10 to 15 square feet should be allowed per child seated. A high school will take the maximum amount. The placement of tables should provide an aisle of at least 18 inches between backs of chairs after the children are seated. The main passage needs to be at least 3 feet wide. Chairs, rather than benches, and tables seating no more than eight are desirable. Comfort in eating contributes to enjoyment of the meal and to good social conduct. Acoustical treatment will also make the lunchroom a more comfortable place.

Dishwashing

In school cafeterias students carry their soiled dishes to trucks or to a window where some one scrapes them in preparation for washing. Large schools usually have a separate dishwashing room adjacent to the kitchen and dining room, but in small schools the dishwashing unit is usually part of the kitchen. Public health regulations are very specific for dishwashing, and requirements for washing, rinsing, and sanitizing should be checked before installations are made. Facilities for maintaining proper temperatures of water must be provided.

For programs serving more than 150, a dish machine not only facilitates work, if it has been installed for efficient use, but assures properly washed dishes. Where a mechanical dishwasher is not used, three sinks 18 to 24 inches square with at least 60 inches of work surface for scraping, stacking, and draining are required. Space must be allotted for storage of dish baskets or racks when not in use, and for holding cleaning supplies.

Manager's Desk

Too often no place is set aside for the manager's desk. In a small kitchen, a hanging "desk" near the receiving entrance, so that invoices can be checked as food and supplies are brought in, will serve the purpose. In that case, the manager must have a desk and filing space for her records in a corner of the dining room.

In larger kitchens, a room, partly glassed, for desk, files, and chairs is desirable. It must be so located as to make supervision easy.

Workers' Rooms

Facilities to meet public health and sanitary regulations as well as to provide for the comfort and well being of employees are necessary. In a very small program, teachers' restrooms are often used by cafeteria workers. When new lunchrooms are built or old ones remodeled, workers' rooms containing lockers, toilets, and lavatories should be included. People working with food must not wear street clothing on the job; therefore, they must have a room in which to change clothing and hang wraps. Ideally, the room

for workers should be located so that they will have access to it before entering the kitchen. It should be convenient to the kitchen.

Selecting Equipment—Size and Cost

For a long time the cry has been "not enough space and too little equipment." An equally serious situation is too much space and too much or too large equipment for most efficient use in the situation. Great distances between pieces of equipment and separate working units in a kitchen are wasteful of workers' time and energy. Passages of 4 feet in the kitchen are ample.

The kind of equipment selected should be determined by the usual menu, and valuable space in the kitchen should not be filled with equipment that is seldom used. In some cases it might be wise to change the menu pattern slightly and omit some pieces of equipment that are used infrequently. Labor saving devices justify the cost of their purchase only if they are needed to do a more efficient job, and are installed and used correctly.

Foods which stand for long periods before being served lose nutritive value rapidly. Therefore, mechanical mixers and peelers should not be large enough to do the total job at one time and then stand idle. Rather, the preparation should be staggered, using a smaller machine, so that no long holding period is necessary. This practice will help to eliminate equipment that is too unwieldy to be easily handled by women.

All too often cheap equipment is purchased because funds are low, but in the long run the expenditure is high because of fast depreciation. If the cost of more lasting equipment can be pro-rated over a longer period of time, the overall costs will be less. School lunch programs are not emergency measures and should not be treated as such.

Cooperation Ensures Efficient Operation

The limited or lacking budgets for school lunch programs have often been the reason given for no program or a poor one. Experience shows that when the worth of a school activity is realized by the community, means are usually found to support it. Every year more state legislatures are appropriating funds to help cover the costs of operating school lunch programs as their value is demonstrated.

U. S. D. A. photograph by Manthey



Manager's desk centrally located makes supervision easy

The school lunchroom can accomplish its purpose only if it is efficiently operated. Although efficiency is dependent upon the quality of supervision and labor, a well-equipped workroom is of prime importance. Even a small program with one or two workers can be a good or a poor working situation according to the kind of equipment selected and its arrangement in the room.

The school lunch program needs the thinking of school administrators, teachers, community leaders, food service managers, nutritionists, architects, sanitarians, and equipment engineers if its development is to go forward.

STANDARDS FOR VISUAL AND AUDITORY FACILITIES IN NEW EDUCATIONAL BUILDINGS

By IRVINE H. MILLGATE

Visual Education Consultants, Inc., New York, New York

and O. H. COELLN, Jr.

Executive Secretary, The Visual Equipment Manufacturers' Council, Chicago, Illinois

MECHANICAL equipment used in visual and auditory education should meet the following specifications:

1. Require a minimum of handling.
2. Require a minimum of teacher manual dexterity.
3. Fit in with other educational processes.

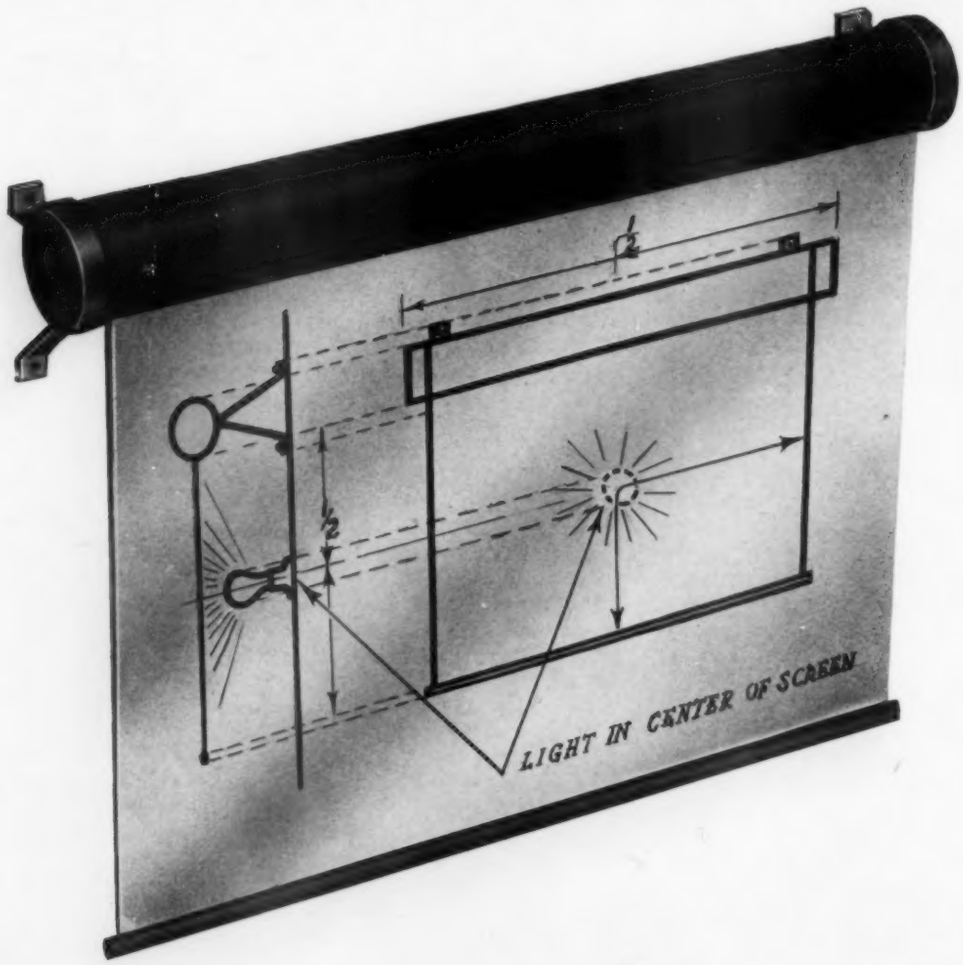
This study was prepared with these three criteria as guide.

Over-all Common Requirements

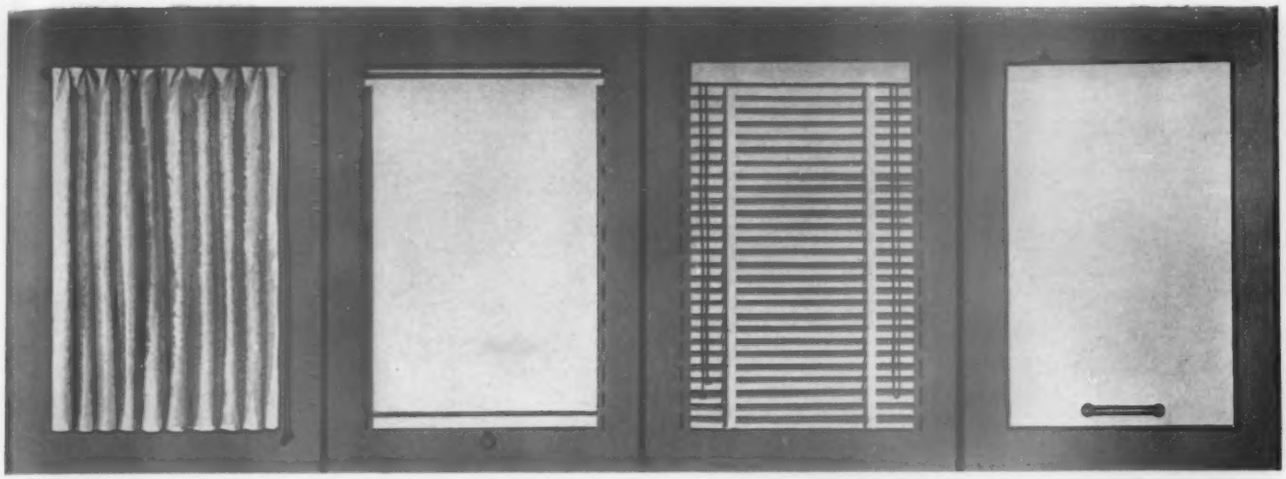
Darkening Rooms

Experience has proved that student concentration on the screen increases as the room becomes darker. The degree of darkness will be determined by the effectiveness of the darkening equipment used. The growing tendency toward larger glass areas increases the difficulties of darkening rooms. If a room is in comparative total darkness, a halo of dim light from a source behind the screen will relieve the eye strain resulting from the brightness ratio between the screen area and its surroundings.

A room in comparative total darkness requires a small individual directional light source controlled by each student for note-taking. If the darkening equipment provides a semi-darkened room, then the note-taking light is unnecessary. The darkening equip-



"If a room is in comparative total darkness, a halo of dim light from a source behind the screen will relieve the eye strain resulting from the brightness ratio between the screen and its surroundings"



Four economical methods of darkening rooms (left to right): drapes, roller shades, venetian blinds, and black-out shields. When drapes are used with windows open, room is semi-dark; black roller shades will create total darkness; shades matching interior color scheme, semi-darkness. Metal, lightproof felt-lined slot should be provided for edge of shade. For extra long windows, shades can be made in upper and lower sections. Venetian blinds will produce semi-darkness; edge should be encased in light-retarding box. Black-out shields of ½" celotex or 3/8" plywood will provide total darkness but are not practical for large areas

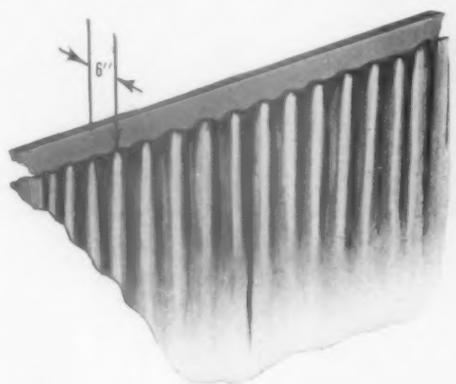
ment used will vary with the budget and climatic conditions.

Ventilation in Darkened Rooms

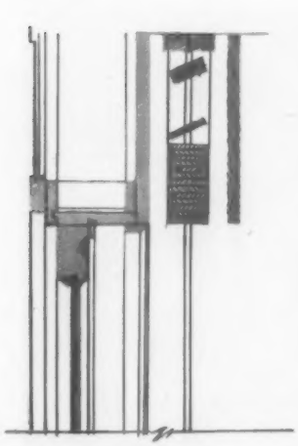
The most modern structures not only provide fc: central mechanical circulation, but even go so far as to air condition and sterilize the air. If each room is ventilated from a central system, the problem of darkening the room is simplified.

If the room depends upon open windows for the passage of air, it will be necessary to provide a light-proof method of ventilation while the windows are covered with darkening equipment. If drapes are used and there is no provision for ventilation except through the open windows, it will be necessary to hang the drapes 6" from the wall to allow circulation around them during the period in which the room is in semi-darkness.

Roller shades and black-out shields require either window grills or a circulation system since they shut the passage of air through the open windows. Venetian blinds will allow for passage of air between the slats for short periods of time. They have the disadvantage of being expensive to install and maintain. Unless they are installed above the glass area in a recess, they will cover a part of the glass area at all



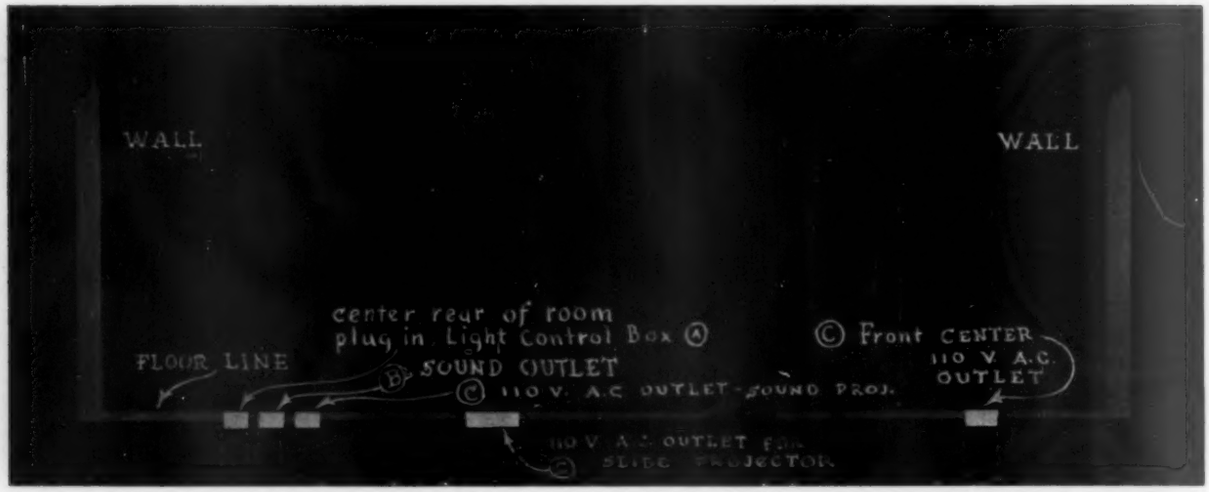
Above—If ventilation depends on open windows, it will be necessary to hang black-out drapes 6" from wall for circulation of air

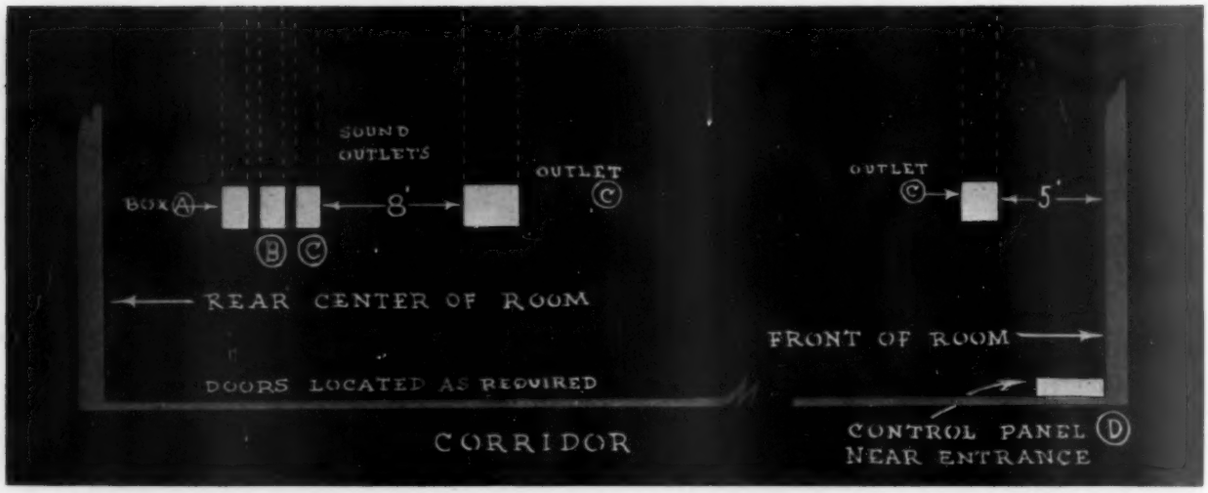






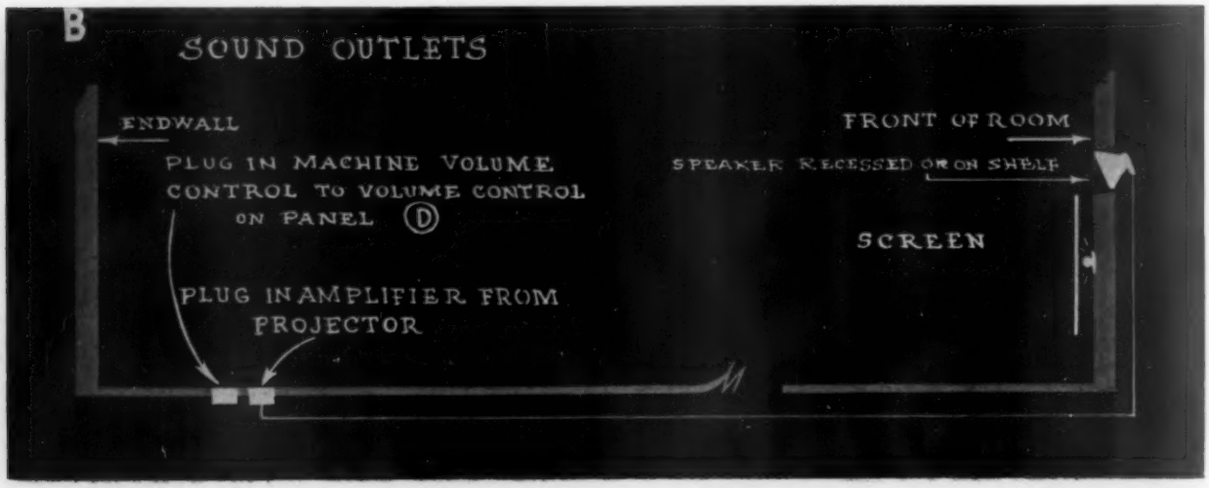
Left to right—Window detail, pertaining to room not mechanically air conditioned; (1) if venetian blinds are used, blind should be installed in a recess above window area so as not to interfere with normal passage of light; (2) window grills installed on inside with use of drapes; (3) air duct built into wall beneath the window sill

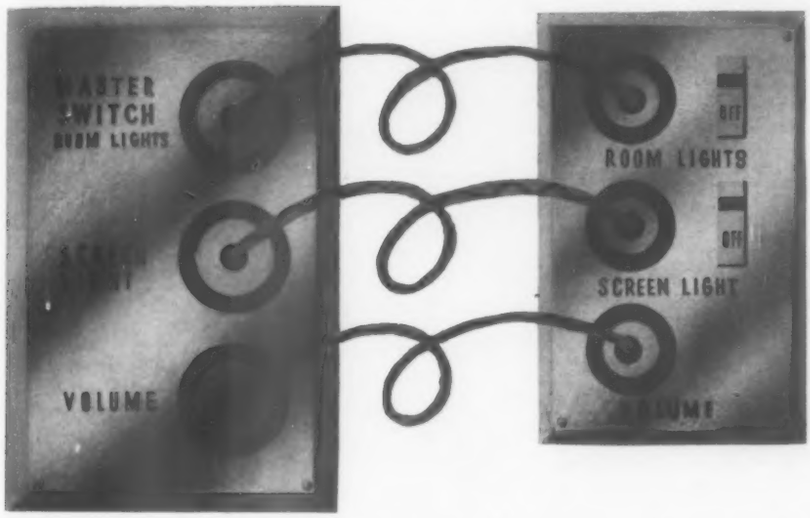




Provision should be made for elimination of cables on top of the floor; location of outlets so that both sound and slide projectors can be connected at different distances from the screen; remote control of projection equipment

This sound outlet is also used for play-back phonograph or wire recorder. It will be necessary to provide a plug-in connection on the projector to control volume from panel (D) located in front of the room





For rear of room controls, floor plate plug-in, Box A, at left. At right, room lights control, Box A', to be installed on projector stand and to be plugged into Box A. Installing a plug-in system for controlling room lights and light behind screen will eliminate necessity of installing wiring in partition walls

VOLUME CONTROL LOCATED ON PROJECTOR

Outlet C below. One side of this 110 volt A.C. outlet connected to control panel (D) in front of the room

times, which will effect circulation and light entry when not in use as a part of the darkening equipment.

Electrical Controls

There are two rules to be observed when installing electrical controls for visual and auditory equipment:

1. Electrical conduits should be placed in floors or load bearing walls.
2. The movement of the teacher from normal talking position, while controlling projection or play-back equipment, should be minimized.

Installation of electrical controls should be governed by the modern trend in educational building, which provides flexibility for remodeling and changing room sizes. End partition walls between rooms are non-load-bearing and left as free as possible from wires, pipes, and ducts. Since all lighting controls will be located near entrance doors, it will be preferable if audio-visual equipment is controlled from the corridor side of the room. Oversize conduits which will allow for future additions can be installed either in the exterior walls or in the floors.

All electrical controls should provide for:

1. Elimination of cables running on top of the floor.
2. Location of outlets so that both sound and slide projectors can be connected at different distances from the screen.
3. Remote control of projection equipment.

In the beginning of this study, we stated that it is necessary to install visual and auditory aids so as to fit in with other educational processes. It is important that the operator of projection equipment be able to control room lights and operate the equipment without the distraction of walking from one end of the room to another. The projector should be pre-loaded and pre-focused before the class begins. Of course, if more than one picture is used during the instruction period, loading distractions can not be entirely avoided. You will note in the drawings that the front of the room control (D) panel also controls the volume. It will be necessary to provide a plug-in connection on the projector to include this feature.

Projection

1. Projection equipment: Visual aid equipment should be installed so as to require a minimum of lifting on the part of the teacher yet be as movable as possible. We recommend the projector be mounted on a rubber caster projection table of 1¼″ pipe frame construction with ⅜″ plywood bolted on three sides. The top is ¾″ plywood. This table can be built in any school metal and carpenter shop or built by a contractor.

Control box (A) has an extension cord coiled up on the lower shelf to be plugged into the floor plate (A′) to control room lights, light behind screen, and volume control. Cable box (E) is permanently connected to the projector to plug into 110 AC outlet (C).

The projector stand is 4′ 2″ high at the lowest point. The four rubber casters are mounted on a ¾″ steel pipe which will extend to 1′ 4″, making the stand 5′ 6″ high when the legs are fully extended. The ¾″ steel pipe attached to the casters is bored every 4″ so that a ⅛″ hard steel pin can be slipped through in order to adjust the height of the stand. If the projector is adjusted to its highest level, it will be necessary to provide a small portable stool. This stool can be housed in the bottom shelf of the stand for use when threading the projector. This adjustable

PLUG IN A. C. LINE OF PROJECTOR CONNECTED TO CONTACT BOX D

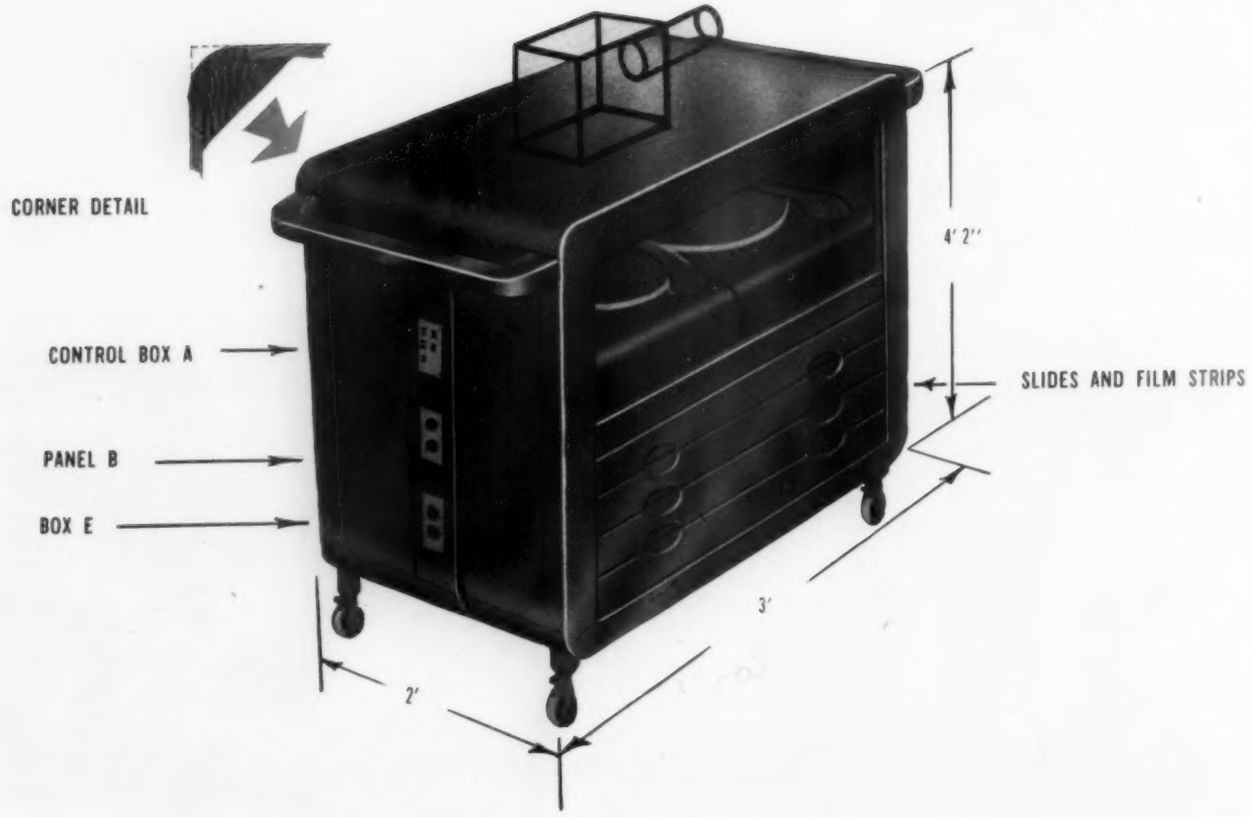
STRAIGHT 110 VOLT A.C. CONNECTED TO CONTACT BOX D

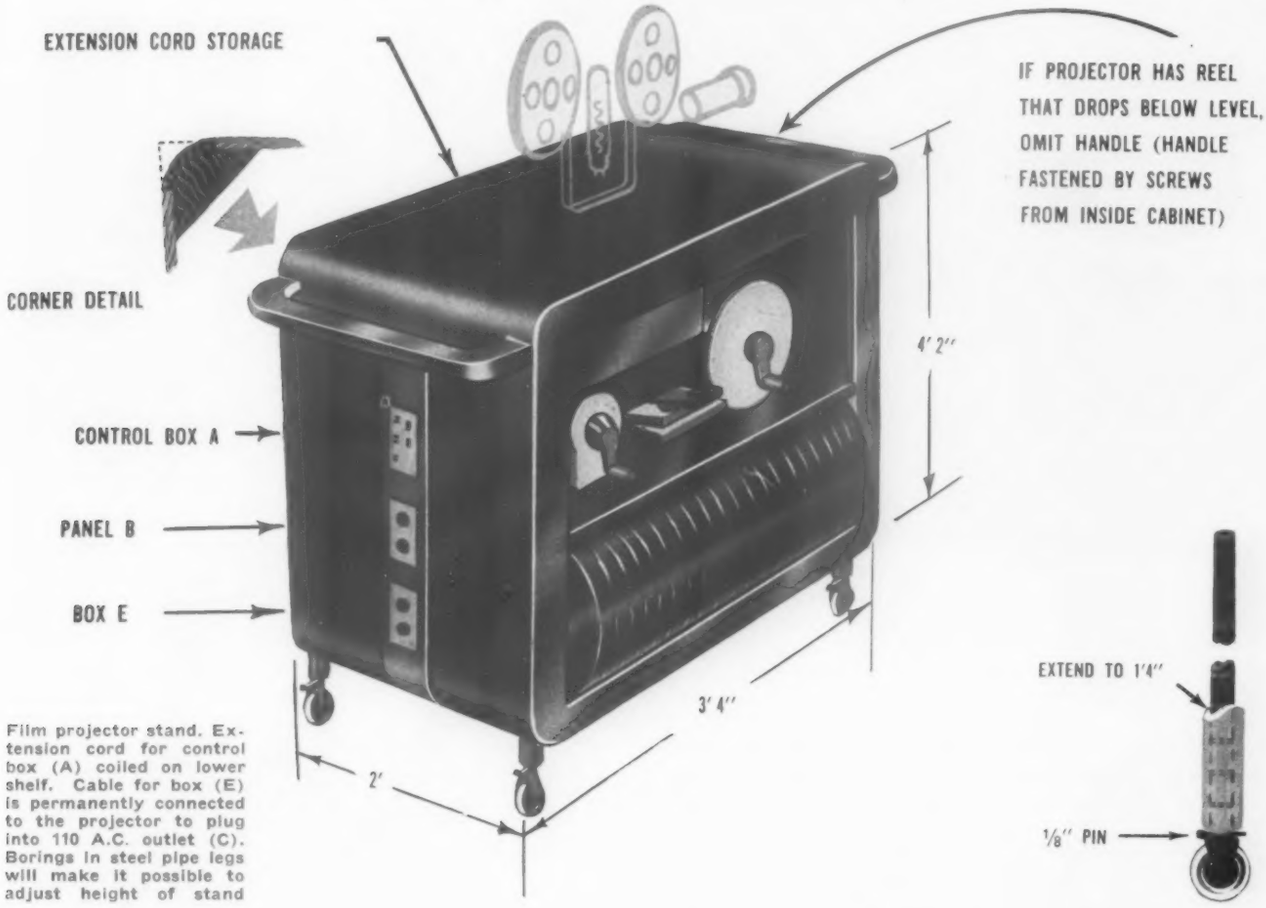




Left—Control panel (D), located near entrance or front of room

Below—Slide projector stand, with provision for record player and play-back equipment on first shelf; slide and film-strip storage on lower shelves





Film projector stand. Extension cord for control box (A) coiled on lower shelf. Cable for box (E) is permanently connected to the projector to plug into 110 A.C. outlet (C). Borings in steel pipe legs will make it possible to adjust height of stand

projector stand makes it possible to use the projector above the heads of the students.

The same type of stand should be made for the slide projector. A record player or other microphone-equipped recording and play-back equipment can be installed on the first lower shelf. The lower shelf is used for storage of slides, film strips, and literature.

These movable projection tables make it possible not only to use the projector under different conditions in the room, but to wheel the projector to other rooms on the same floor of the building.

2. Screens: The width of the screen should be one-sixth of the greatest length of the room. The light behind the screen should be a 25w amber-colored bulb. The screen is mounted in a roller case on wall brackets and is pulled down when needed. It is important that each projector be accompanied by a portable screen in case the instructor should want to use the equipment in another part of the room.

3. Speakers: The speaker should be located above the center of the screen. It should be tipped so as to aim the center of the speaking cone at the center of the audience. The illusion of naturalness is broken if the sound does not accompany the screen.

Some building programs include public address systems. The amplifier and speaker on a public address system are designed to function together. The same is true of the sound projector. It is recommended that a dual speaker system be installed for classrooms. In the case of the auditorium, it may be feasible to design an amplifier that will function on the sound projector and public address system speaker. We refer you to the manufacturers in this instance.

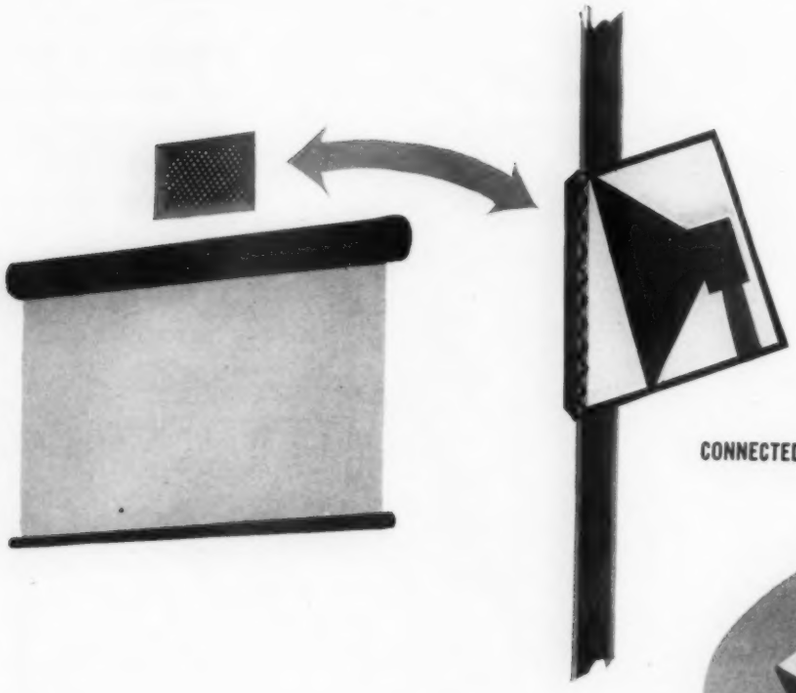
This study will not treat the newer experimental forms of projectors such as rear or translucent screen images. It will be well to mention that a practical console type of rear projector is available at a price. Please refer to page 151 for a reference on shop rooms.

We strongly recommend that the projector be as portable as possible and that all controls to the projector make its use as flexible as possible.

The plan recommended here requires the instructor to pre-focus and pre-test the equipment before the instruction period begins.

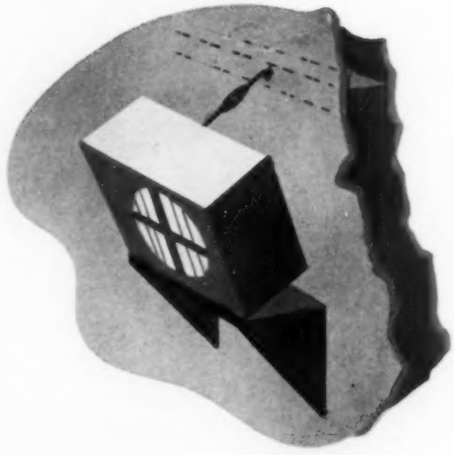
Acoustics

There is probably no phase of construction more neglected than acoustics. It would require several volumes and a bona fide sound engineer to cover the subject exhaustively and to interpret the many variations. Couple this problem with the growing tendency to make all partitions non-load bearing and movable, and it becomes even more difficult to make a specific recommendation. This study will take up only the main problems of the visual and auditory phase of acoustics. To be very technical, the temperature and shape of the room, the moisture in the walls and air, the material used in the building,



Bottom of page—"Movable partition walls . . . of fireproof acoustical wallboard, with dead air space between the surfaces"

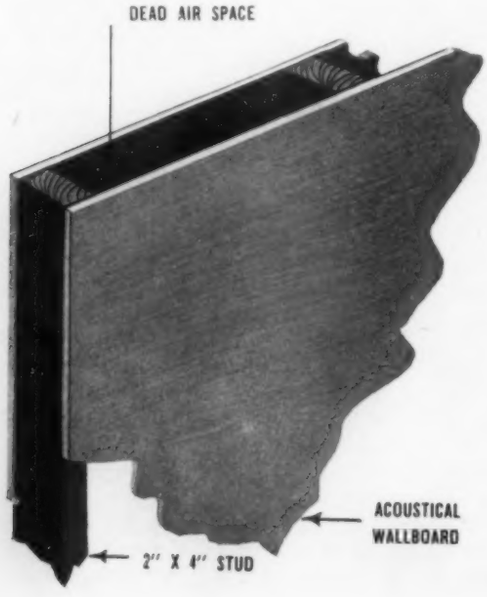
Left—"The speaker should be located above the center of the screen . . . tipped so as to aim the center of the speaker cone at the center of the audience



and the variations in the number of students should be dealt with. We will make only the major points here and urge those responsible for planning a building to call in a bona fide sound acoustical engineer for consultation. The Johns-Manville and Celotex organizations are leaders in the field of sound engineering. Such firms should be consulted before construction begins.

If you will refer to page 141, you will note that, under *"Speakers,"* we began to treat the subject of sound.

The position of the source of sound, and the original reflecting surface to disperse it in the listeners' direction, is the first consideration. We emphasize that the sound should be aimed at those who listen to it.



Second, choice of building materials, in order to cut down reverberation, is important. As soon as sound leaves its source, it will travel in a widening circle until it hits some object and is reflected back at a right angle to the plane of the reflecting surface. If the wall is flat to the path of sound, then it is reflected back in the same direction from which it came. Reflection of the sound creates what is known as sound reverberation. Reverberation garbles sound and makes it unintelligible.

As soon as sound strikes a reflecting surface, it is partially deadened, the amount of deadening depending on the quality of the surface itself. Ordinarily, material that is heat insulating is also sound deadening. The use of acoustic plaster and wall board is good for both sound and heat. Drapes used as darkening equipment will partially improve acoustics on one wall.

Movable partition walls should be constructed of fireproof acoustical wallboard, with dead air space between the two surfaces.

The building should be finished with all walls acoustically treated and all chalkboards and other

equipment installed. After the rooms have been used for a short time, permitting the instructor to discover any bad sound features, it will frequently be necessary to install several sound baffles on the walls and ceilings in order to improve the sound qualities still further.

A sound baffle is made of acoustic board and must be designed for each room separately. Consult a sound engineer for this treatment. Each and every room will present a unique problem.

Application of Principles to Specific Rooms

Up to this point, we have stated the considerations which should govern any planning for the future use of auditory and visual aids covering:

1. Darkening rooms
2. Ventilation in darkened rooms
3. Electrical controls
4. Projection
5. Acoustics

If the points are clearly understood, then it is possible to apply them to any given situation with such adaptations as are necessary. This study would not be complete if we did not suggest specific applications of our recommendations to the following rooms:

1. Classrooms
2. Auditorium
3. Audio-visual laboratory
4. Science and shop rooms
5. General library reading room

Classrooms

We recommend, in addition to observing the recommendations stated, that:

1. Consideration be given to chests and storage cabinets.
2. Where partition walls are movable, all electrical controls, such as panel (D) be placed in the floor with a hinging cover over the panel.
3. Where the control panel (D) cannot be installed, and it is necessary for the instructor to remain in the rear of the room during the projection, an extra desk be provided with a small reading light for the use of the teacher while the room is dark.
4. All visual and auditory aids be stored and filed in the audio-visual laboratory where they can be checked and repaired and a record kept of their use.
5. Work bench 4′x12′ be provided for preparation of sand tables, charts, maps, diagrams and models.

Auditorium

Auditoriums throughout the country can be classified under one of three groups:

1. With or without a balcony, seating more than 1000 persons.
2. Auditorium-gymnasium combination.
3. Seating fewer than 1000 persons.

Regardless of the size of your auditorium, there are some basic requirements to be met. Many of the points made under our five over-all requirements apply in full measure to the auditorium.

Basic requirements for the auditorium are:

1. Supplementary electrical controls of equipment and house lights should be placed so that a single person can handle the visual and auditory equipment without leaving the front of the room. Control panel (D) should be located near one side on the front wall.
2. Six 110 AC floor outlets (C) and six floor sound outlets (B) will be required: two pairs located in the front of the auditorium, equidistant from the side walls, and two pairs of outlets in the middle of the auditorium, equidistant from the side walls and located in the same relative position in the rear as in the front. These outlets can be used if it is necessary to set up projection equipment outside of the booth for small groups. These outlets are fed through control panel (D). Note: see page 139 for description of outlets.)
3. It is necessary to darken the auditorium entirely. One of the four methods stated (page 137) should be

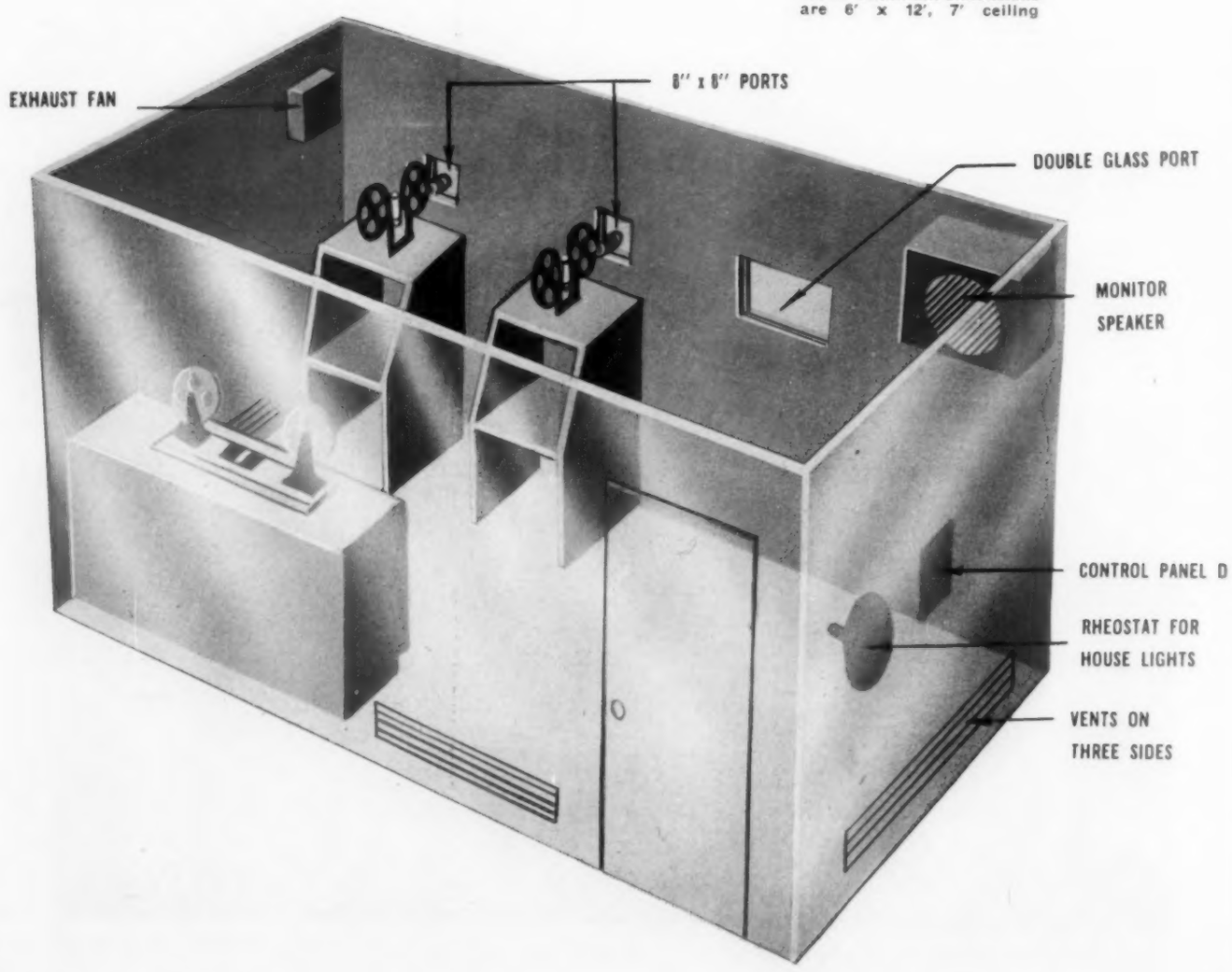


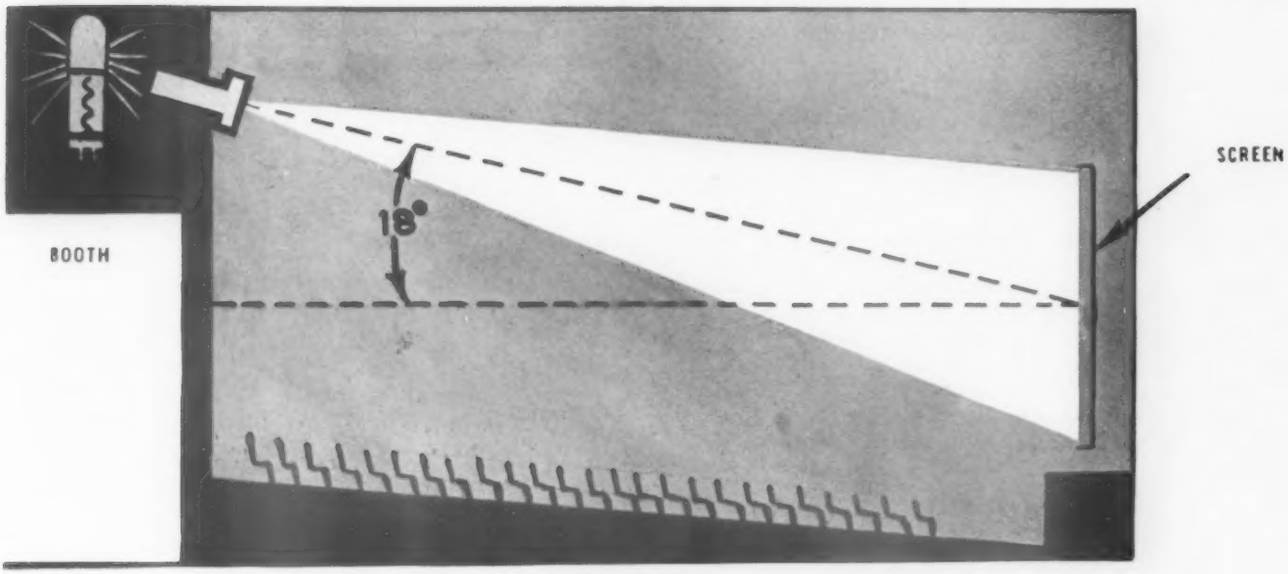
Plan for auditorium outlets. These outlets can be used for projection outside of booth for showings of films to small groups



Left—Work bench for preparation of sand tables; charts, maps, diagrams

Below — Dual projection room. Minimum dimensions are 6' x 12', 7' ceiling





Maximum declination

used. In all cases, it is necessary to provide mechanical ventilation.

4. A ventilated 16 mm projection booth is most desirable in an auditorium. We have already stated that a 16 mm projector should be used. The 16 mm projection booth should be located not more than 150 feet from the screen. If the auditorium has a balcony, the booth should be located on the front of the balcony. If the auditorium does not have a balcony, then the booth should be hung from the ceiling at a height not to exceed the maximum declination.

A cat walk or a roof entrance can be provided if it is not feasible to enter the booth from a ladder at the floor level. The booth can be located on the rear wall of a small auditorium, providing it is not more than 150 feet from the screen. It should be next to the ceiling at a height not to exceed the maximum declination.

The minimum dimensions for a dual projection booth are 6′x12′ with a 7-foot ceiling. If a single projector is used, a booth 6′x8′ is required.

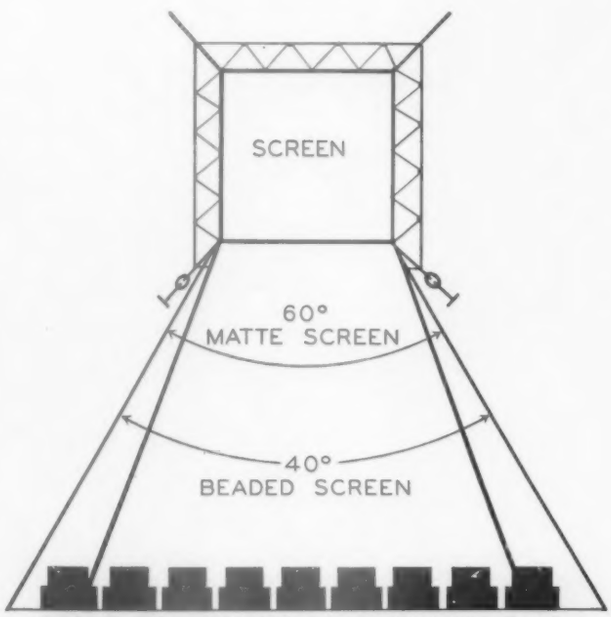
You will notice we have suggested the use of a control panel (D), so that a person can run the projector without being in the booth. This panel is located in the front of the auditorium. The projector is pre-loaded and pre-focused. After the projector is started up, the instructor can retire to the booth to make any further adjustments needed without distracting from the presentation. The monitoring speaker is necessary so that the quality and volume of sound can be regulated in the booth. The speaker is adjusted with a resistance in order to compensate for the small booth. The operator can at all times judge the volume accordingly. Motion pictures and slides are stored in the audio-visual laboratory.

5. "Auditorium" suggests perfect acoustics; there should be no short cuts when it comes to acoustics in the auditorium.

6. The small light behind the screen is required in the auditorium as well as anywhere else. The amber bulb will have to be increased from 25w to 50w if the screen width is more than 6′2″. You may find it advisable to turn out this supplementary light after the projector has run a few minutes. There is more light diffusion in a large room than in a small classroom. After the eyes become adjusted, it may be turned off.

The width of the screen should be one-sixth of the longest dimension of the auditorium. The first row of seats should be no nearer than two times the width of the screen.

The accompanying sketch indicates the angle of the nearest seats to the screen. We recommend that the screen be square since slides may be used; if mixed



vertical and horizontal pictures are shown, the screen will cover both.

There are several types of screens for use in the auditorium. They are:

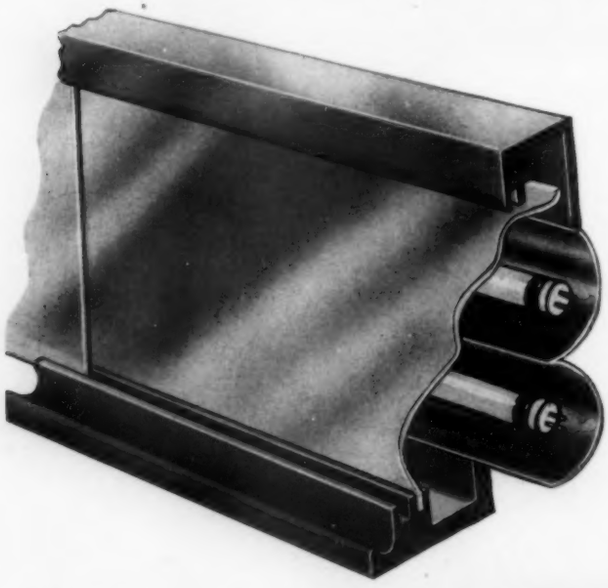
A. Cork wall (least desirable)

B. Fly: the screen is laced on a pipe frame and dropped from the back stage. The bottom of the frame is hooked into an eye on the stage floor. If this type of screen can be covered to protect it from dirt, it is practical.

C. Stand: this screen is laced into a frame placed on a stand supported by two adjustable stage props that are screwed into the floor. The highest angle of sight over an extended period of time should not be above 20°.

7. The two speakers should be located as near to the screen as possible. If the top of the screen is not more than 17 feet above the floor line, then the speakers should be located just above the screen, not more than 20 feet above the floor line. Each speaker should be aimed at the center of its middle half of the audience. If the speakers are placed more than 17 feet above the floor, the accompanying sketch suggests how to locate them properly.

Some re-aiming of the speaker cones may be required if the acoustics of the auditorium are not balanced.



Above — Frosted glass chalkboards (use black chalk) for front of visual demonstration room

Audio-Visual Laboratory

A well-planned visual education program requires a center for operations. Such a center should provide the following minimum facilities:

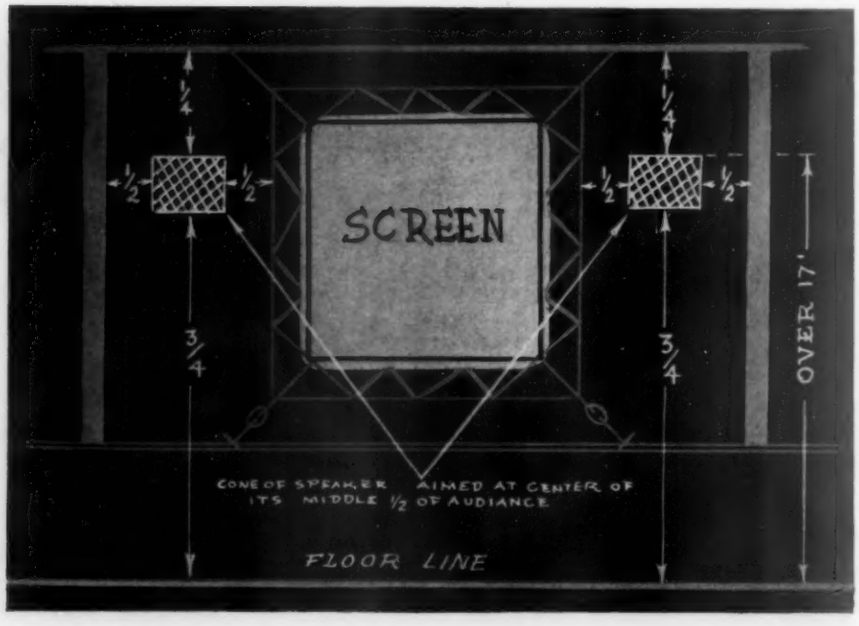
1. A visual demonstration room where several groups can join for specially prepared projects
2. Facilities which will enable instructors to preview and evaluate new visual aids
3. Library, storage, and booking system for all visual aids
4. Inspection equipment for repair and maintenance of films and slides
5. A small dark room

Optional requirements are:

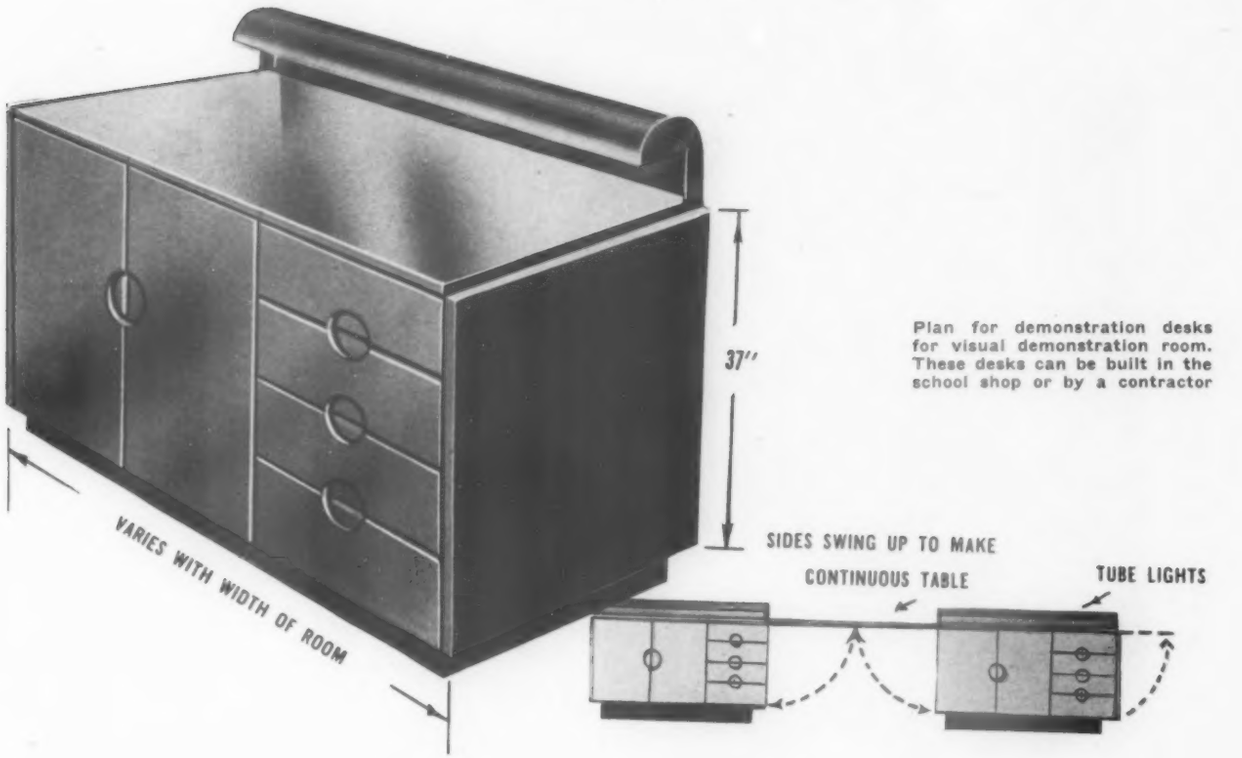
1. Motion picture and slide film production equipment
2. Monitoring system
3. Radio room

The audio-visual laboratory is made up of one large and three small rooms: a large visual demonstration room; a small projection booth for demonstration room; a small library, storage, and checking room; and a small dark room. These rooms should be interconnecting if possible. Each of the requirements listed can be met on inside wall space. The rooms should be air-conditioned to maintain a stable temperature between 50-70° and a relative humidity of 45-68%. The over-all requirements already elaborated upon will apply to these rooms as well.

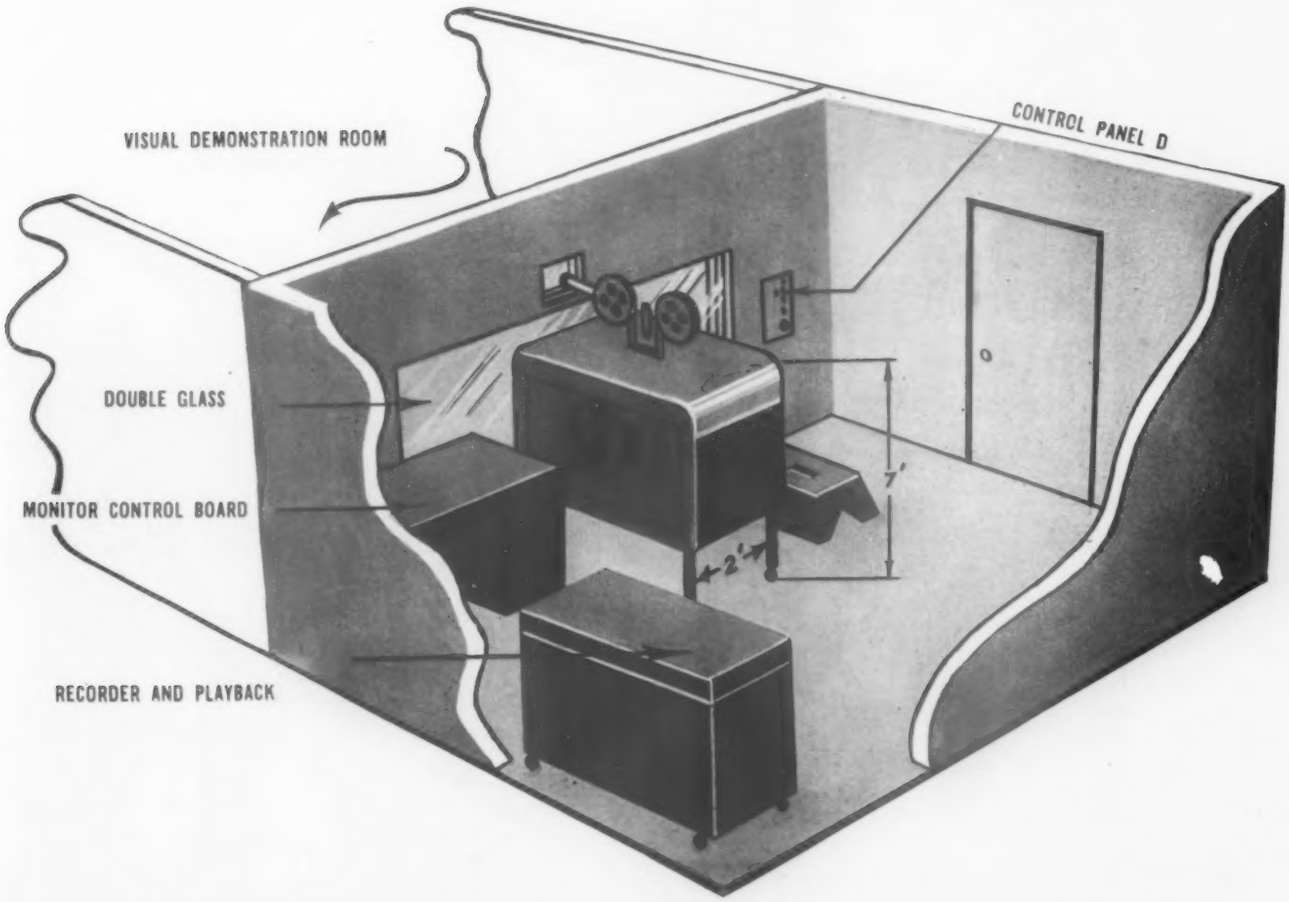
The visual demonstration room should have a sloping floor of 8 inches in 4 feet. The front of the room



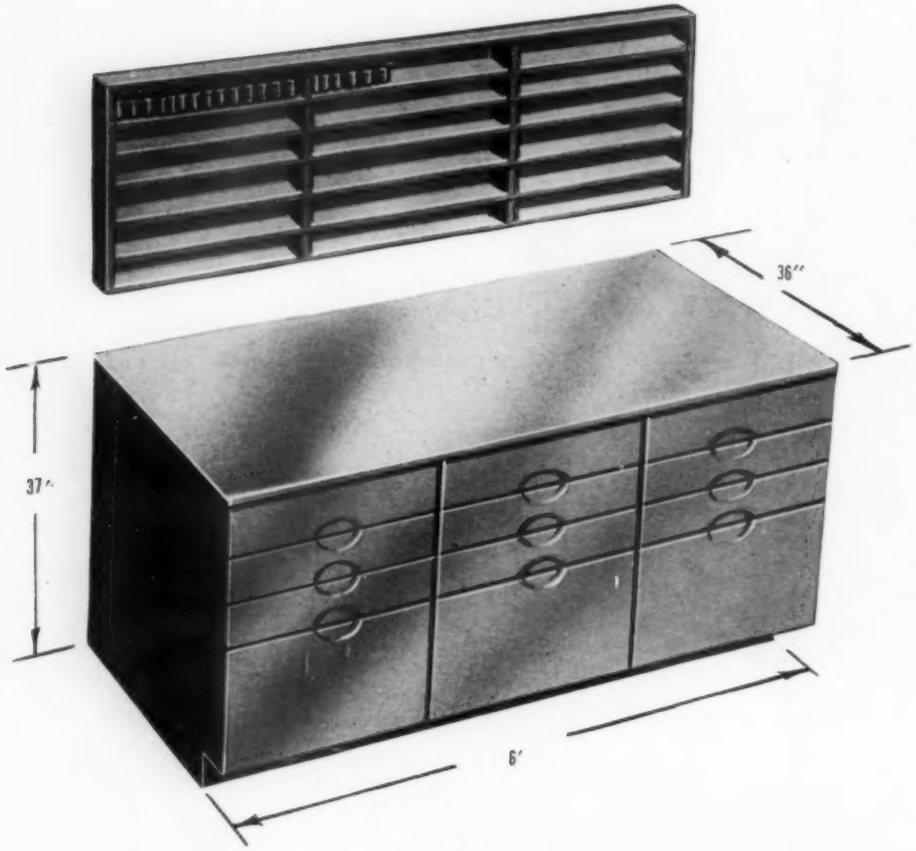
Right—Plan for locating speakers when placed more than 17' above the floor line



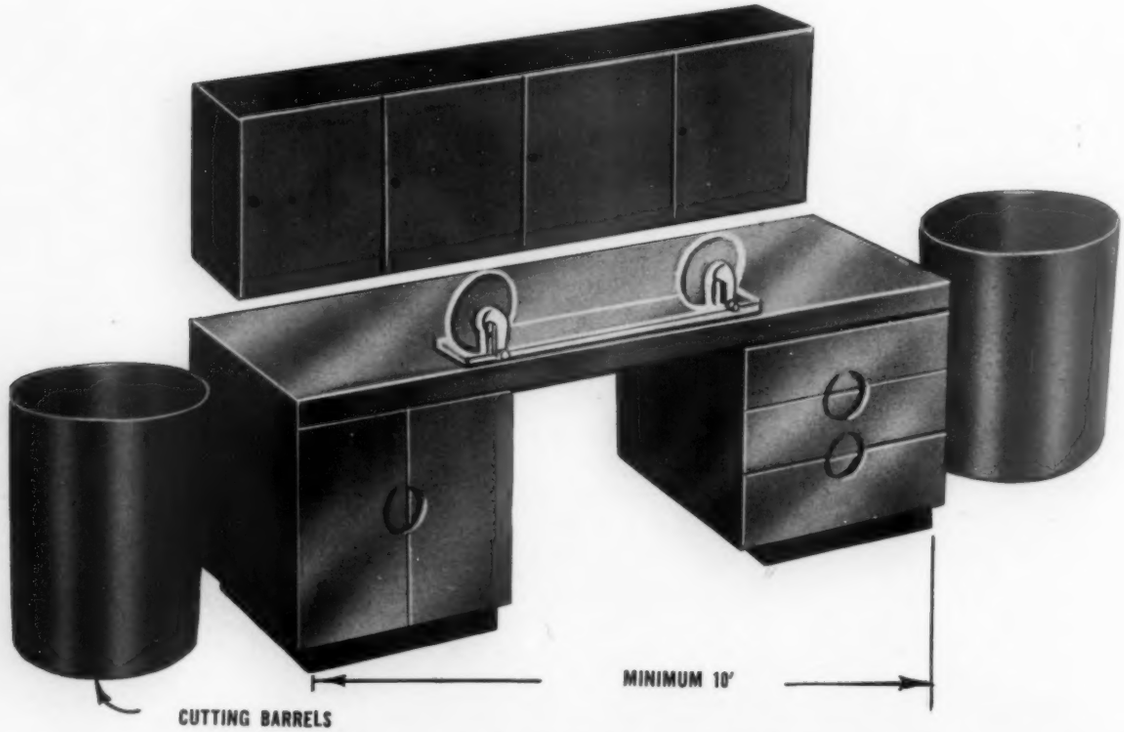
Plan for demonstration desks for visual demonstration room. These desks can be built in the school shop or by a contractor



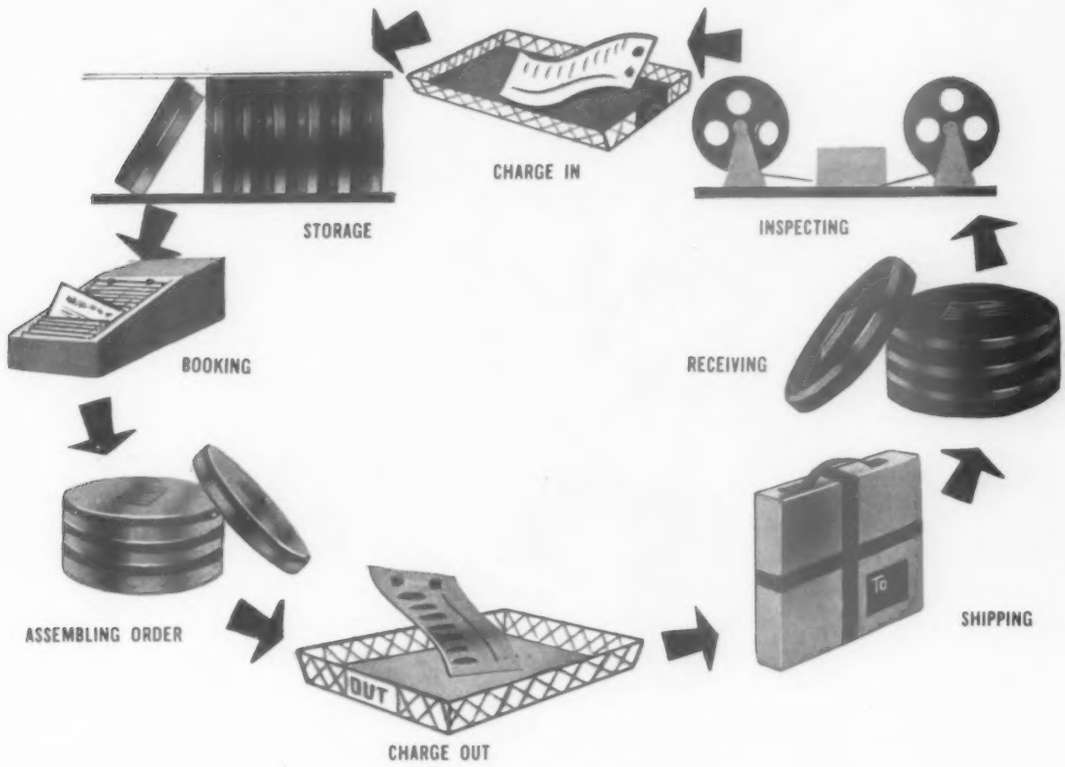
Small projection booth adjoining visual demonstration room



Storage cabinet for film strips and slides



Film inspection table for library of audio-visual laboratory



Film cycle in a central visual aids library

should be equipped with frosted glass chalkboards, pull-down screen, speaker and two demonstration desks. (See page 142 for speaker detail.)

Please refer to page 144 on projection booth for auditorium.

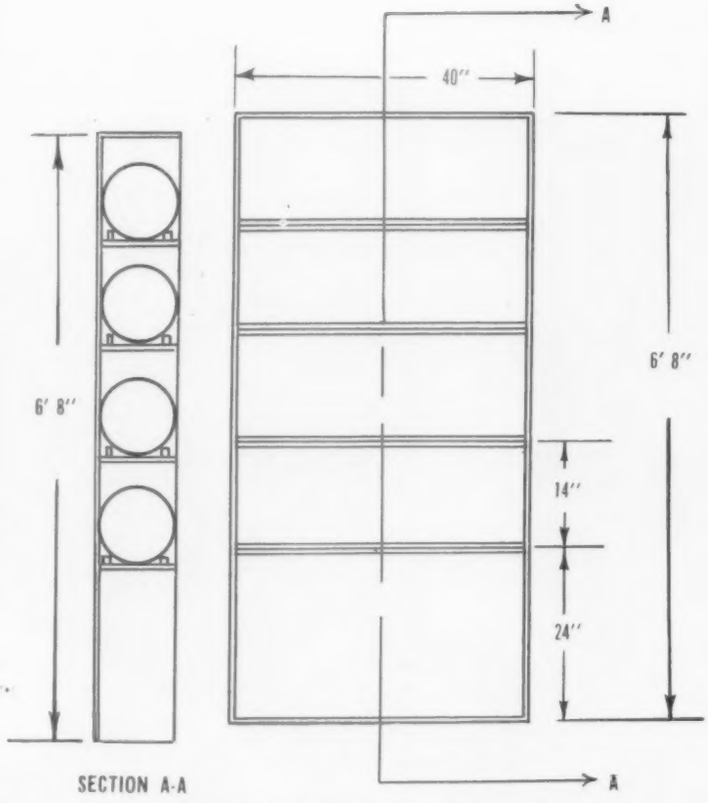
The projection booth should be built to serve several purposes. Among them are:

1. Projecting pictures
2. Operating monitoring system if installed in the building

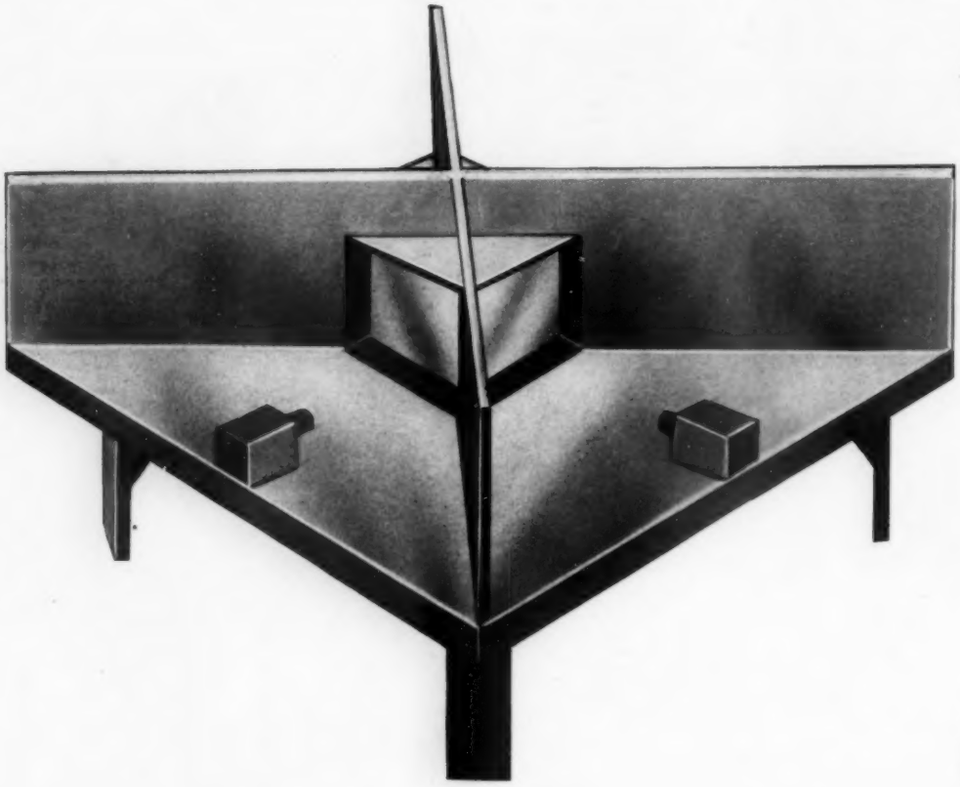
If the monitoring system is installed in the projection booth, it can be used as a radio control board. The visual demonstration room itself can be used as a studio. In that case, level floor is best. The flat floor space should be at least 25′x15′.

The projector can be rolled back on the projector stand to leave space for movable play-back and recording equipment. The remote control panel (D) should be installed at the front of the demonstration room from which place instructors can preview and evaluate new visual aids and control the projector if they do not have an operator available. The remote control features described under "*Electrical Controls*" (page 139) are even more necessary in this room.

This study has pointed out that all visual aids should be stored in a central library. This not only facilitates proper care of films and other aids but will result in the widest



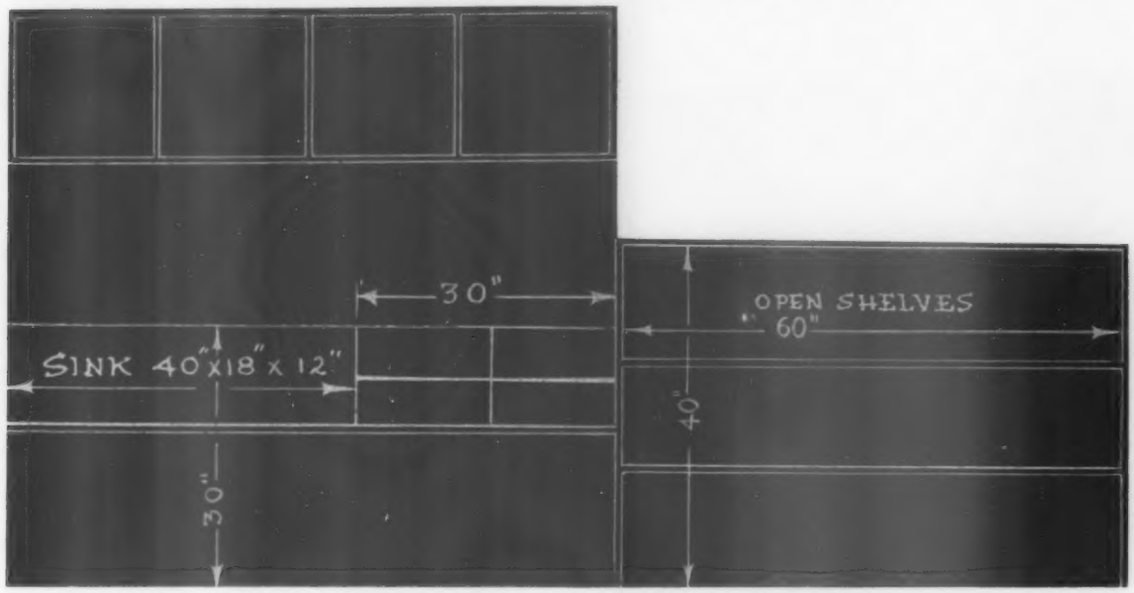
Detail of rack for storage of film reels



Left—Slide projector table. Size of the unit depends on available floor space; a minimum is 4' x 4'. Note shadow box with small screen for daylight projection

Below—Play-back phonograph (cover should be down while equipment is being played; ear phone cord is pulled through notch in cover)





Darkroom for audio-visual laboratory, showing minimum requirements

possible use of them. The film library cycle is illustrated on page 149.

The size of the library, storage, and checking room is not large. Approximately 8'x16' will serve nicely. It is recommended that all film subjects be carefully selected. This means continuous elimination of old material. The library should not be a junk room. A rack 40" wide by 6'8" high will store 100-800 foot reels. (See detail of racks.)

The library will require an inspection table at which each film can be checked and repaired.

All of the projection equipment should be repaired and checked by the manufacturer or an authorized representative.

A small dark room will have many uses. It will provide an opportunity for students to make still pictures of activities and to produce black and white film strips. The drawing indicates the minimum requirements.

Motion pictures and slide film production facilities will provide an opportunity for students to have a rich educational experience. Obviously, the productions should be inexpensive. Expensive installations for producing sound films are not recommended. The library checking room can be used for editing purposes. A local camera club (note: contact the Amateur Cinema League, 420 Lexington Avenue, New York, for further information) should be interested in this feature of the educational system. It is recommended that the club be consulted for help in setting up a small production studio. The visual demonstration room and the auditorium can be used for studio photography. An 110 AC outlet of at least 400 amps. is recommended for black and white photography, and 800 amps. for color photography.

Abundant storage space with shelving should be provided wherever possible. If space will allow, the office of the director of visual education can be installed in the library and checking room. Otherwise, an office will have to be added to these four rooms of the audio-visual laboratory.

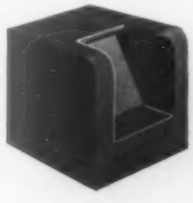
Science and Shop Rooms

The problems of these rooms are much alike as far as visual and auditory aids are concerned. You will note (page 139) a reference made to a console type of rear projector. If you will refer to the drawing (page 140), you will find a practical slide projection table which can be used in the daylight. In all cases, provisions for remote control panel (D) and installation of screen and speaker (page 142) are important.

The principles indicated under "Over-all Requirements" will apply accordingly. The daylight projector is for occasions demanding close coordination between demonstration and visual presentation. Even at that, a projector mounted on a movable table (page 141) and a pull-down screen will be required.

General Library Reading Room

We have stated several times that visual aids are stored in the visual aid library. The general library reading room does not lend itself to showings of sound motion pictures or use of any other type of sound equipment which will interfere with the work of students engaged on other projects. This does not apply to microfilm, slides and film strips, and playback recordings. A system of checking out film strips and slides for use in the reading room will be simplified if the audio-visual laboratory storage and checking room is located near the general library reading room. Storage for records and micro-film should be provided in an enclosed room; regular record cabinets can be used.



Micro-film reader

SCHOOL-INDUSTRY COOPERATION MEANS BETTER AUDIO-VISUAL EDUCATION

By MERVYN V. MILLER

Professor of Audio-Visual Education, University of San Francisco, California

TEACHING by sight and sound is not new. Actually, it is the oldest method of education. However, it needed a world war to unveil its true worth.

Prehistoric man taught his offspring the names and mannerisms of various types of animals by using his campfire as a "projector," the walls of his crude dwelling as a "screen," and his hands and fingers manipulated in various shapes as "film."

In China, 2500 B.C., Emperor Muh brought puppets into his court in order to teach correct court behavior.

Christ used concrete imagery to instruct the masses following him. "Unless you become *as this little child*, ye cannot enter the Kingdom of Heaven." When he told His followers that is was an easy for a camel to crawl through the eye of a needle as it was for a rich man to enter Heaven, they could visualize clearly how impossible such an occurrence would be. The greatest of all teachers employing the audio-visual technique indicates the worthwhileness of this method of education.

Audio-Visual Education During Wartime

The Army and Navy have just completed a masterful job of teaching. Employing audio-visual aids, they instructed greater numbers in quicker time than most high school and university administrators ever dreamed possible. However, we must be cognizant of the conditions under which they functioned—a sixteen-hour school day; focused attention with little, if any, outside (home and leisure) distractions, etc.; and these factors contributed greatly to the teaching achievements.

There is not enough scientific proof available at the moment to justify the claim that army-navy instruction methods proved the validity and usefulness of teaching wholly by audio-visual means.

School-Made Movies Will Do Better Job

But there can be little doubt that audio-visual aids will speed up and improve our system of education. To produce films that will really assist the classroom teacher in doing a better job, schools should work with industry or produce their own films. Educators are equipped best to know what should be taught, what must go into an educational film.

Up to the present time, the field of education has contributed little or nothing in regard to educational film production. Except for educational films produced by a few firms for rental or sale, films for classroom use at the present time are, for the most part, planned as advertising media and paid for by industrial firms. Thus, industry, so to speak, has been doing education's job.

Industry has been willing to pay the bill primarily because such expenditures can be charged off income tax records as "advertising." It is not at all unreasonable to expect a more equitable tax readjustment in this regard which may stifle the present-day philanthropy of industry. When that occurs, and it probably will in a year or two, then education will have to supply its own aids—it will be forced to do its own job. What can be done?

Stanford University Experiment

The production of a commercial 16mm, 1600–foot, color-sound film costs from $20,000 to $150,000 or more, depending on the locations, personnel, and equipment required to do the job. This charge covers the script and the services of an expert cameraman, a specialist on lights and lighting, a film editor, an adept writer to compose *and time* the narration, a professional narrator (or voice), and actors and actresses. To this must be added film cost and a charge for the use of expensive cameras, lights, sound recorders, etc.

City and state systems of education cannot afford such expenditures. At Stanford University, however, we conducted an experiment that offers proof that the job can be done cooperatively at a fraction of this cost. By pooling individual abilities on the college campus, we were able to produce a full-length, 1600–foot, color-sound film, at a cost of exactly $1,224.82 [1] and a grand total of 1,898 man-hours of work.[2]

The film, "The School of Physical Sciences," [3] was planned as a vocational guidance and screening vehicle. Originally it was the plan of Stanford to produce a similar film on each of its ten schools in the hope that incoming freshmen could view these films

[1] The writer handled all the technical phases of production and used his own equipment. Nothing was rented or bought except film and lights.

[2] This includes time spent at conferences, filming and editing time, rehearsals, sounding time, miscellaneous shopping, adjusting, waiting, etc., and time spent in the laboratory processing.

[3] By writing to The Librarian, Stanford University, the writer's doctoral thesis, "The Development, Production, and Evaluation of a Vocational Guidance Film in Student Orientation on the College Level," and a print of the film itself, may be obtained.



Produced as an orientation and vocational guidance film for incoming freshmen, "The School of Physical Sciences," shows class



activities as they actually take place. Seen here are a geology class on a field trip and an experiment in quantitative analysis

and see what particular aptitudes and dexterities are required to do successful work in each school.

It was part of our original plan, and deemed one of the most important phases, to show to what types of work, to what jobs, successful work in each school would lead. But the film was produced during wartime, when many of the plants of a scientific nature were closed to visitors, hence to movie-making. We had to forego actual pictures but included pertinent data in the narration.

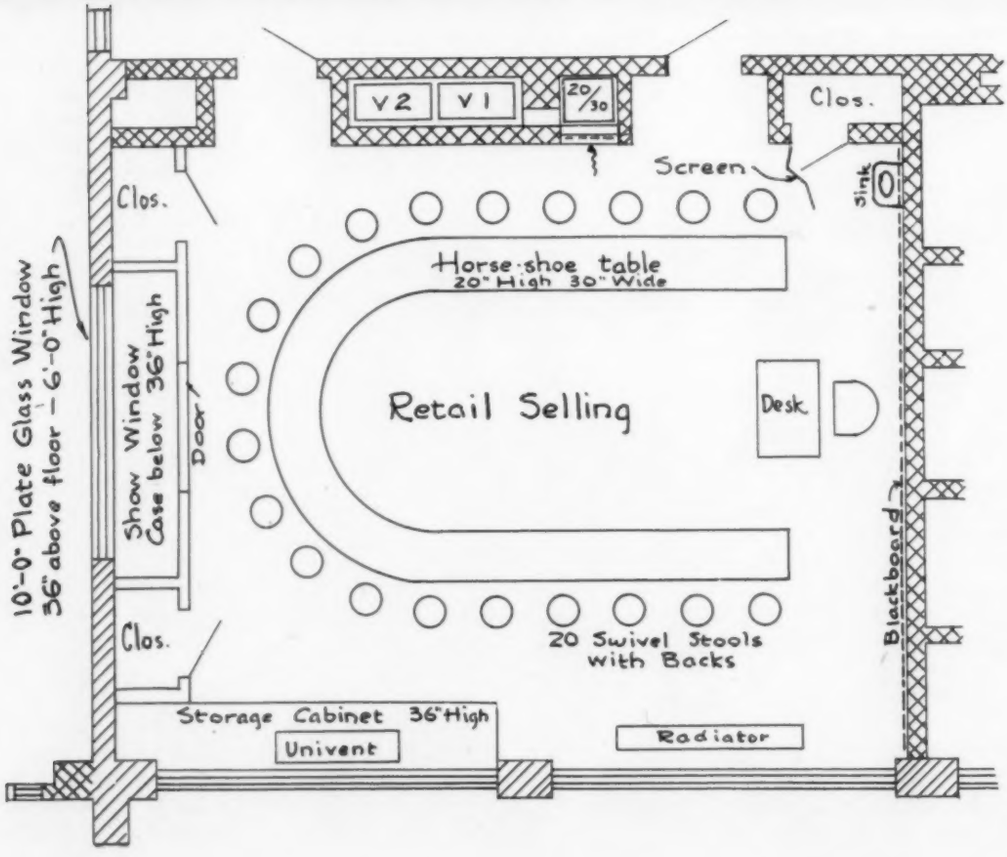
I believe that other universities can do a similar job if there is someone on the campus who knows movie-making and who can coordinate and lead the work.

Possibilities of School-Industry Cooperation

Industry and education need to know and to understand what each is doing and how both are going about it. The school should bring its story to industry, to the man in the factory, to the club, the forum, the grange, the church meeting. Industry should bring its story into the classroom so that students will know what the business world holds for them after graduation.

This close relationship can be accomplished in part by teachers working in industry during the summer months. In learning the actual demands of an industrial job, teachers would be better able to counsel and guide their pupils. Industry and education could further the relationship by producing visual aids, individually or cooperatively, which would bring the story of the school and the story of industry to the farmer, the baker, and the candlestick maker. And when this is done, we shall have real audio-visual education for these modern times.





Above — Distributive education, cooperative plan merchandise display. H. Fletcher Brown Vocational School, Wilmington, Delaware

Left — Retail selling, distributive education classroom at the Springfield Trade School, Springfield, Massachusetts. Note the horseshoe table and swivel stools with backs

BUILDING FACILITIES AND EQUIPMENT FOR BUSINESS EDUCATION

By ALBERT C. FRIES

Associate Professor of Secretarial Science and Director of Business Education, Northwestern University, Evanston, Ill.

A FUNDAMENTAL factor in curriculum construction or reorganization is that adequate provision should be made for plant facilities and equipment needed.[1] Business educators have recognized this requisite to effective and successful teaching in a statement of principles, which includes the following: "Equipment appropriate to the need should be provided, efficiently used, and adequately maintained."[2] It is evident, then, that one of the educators' problems is to study the conditions under which training must be done—the physical facilities of plant and equipment—in order to improve the quality of educational experiences. Such study becomes even more imperative when remodeling of existing facilities is to be undertaken or new building is contemplated.

Relatively little attention has been given in the past to planning building facilities, either in high school or college, for housing modern business education programs. The result has been that these departments are ordinarily handicapped by having to use space which is not adapted to their purposes, and in many cases also without proper equipment. In most of our older school buildings the rooms are very much on the hit-and-miss order, chiefly because rooms designed for other purposes were taken over as the business department expanded.

We are well aware that the purchase of new equipment and building renovation or building construction have been all but forgotten during the war years. We may reasonably expect that during the next few years many schools and colleges will be concerned with the problem of new school building or the remodeling of present structures to take care of increased enrollments. It seems important, therefore, that school and college administrators and architects should be given information regarding proper building facilities and equipment for business education departments. In specific instances, business teachers will doubtless be asked to submit their recommendations for housing and equipping the business department in new or remodeled buildings.

The data and information presented in this article have been secured from state and city supervisors of business education throughout the nation and from certain schools referred to the writer by these supervisors. It was not found possible to standardize these recommendations or to present practices. However, it is felt that the suggestions made represent the serious thought and attention of business teachers and supervisors of layout and equipment plans proposed or now used successfully. No two schools, of course, will have identical problems as they plan for the purchase of new equipment or renovation or construction of buildings. Since no schools have the same conditions to consider in the over-all planning of effective business departments in their communities, the reader will study the suggestions made in the light of the local situation. The establishment of standards for business education facilities and equipment is urgently needed.[3] The suggestions given are not presented as definite standards or specifications for either building facilities or equipment for business departments; rather, they represent the composite thought of many business educators who, through experience, discussion, and experiment, believe them to be improved practice.

Building Facilities

Until such time when standards for business department plant and equipment needs are available, the following suggestions may be helpful in planning for business education space in the school building.

Placement in Respect to Floor

Basement rooms are generally undesirable because of unhygienic conditions. The first floor is an advantageous location because of nearness to administrative and business offices of the school, although the placement of equipment on the first floor encourages theft. Use of the top floor prevents dissemination of machine noises through the building. If it is a large department and the one part is directly above the other and adjacent to a stairway, there may be no real objection to using two floors. Some teachers prefer the privacy of a wing, while others prefer the publicity resulting from a location on a main corridor.

Placement in Respect to Certain Others Rooms

Generally, business departments should be located near certain other rooms, such as restrooms, washrooms, cafeteria, and administrative and business offices of the school. Because of the great amount of writing required in business subjects and the close nature of the work involved, it is recommended that the special business subject rooms be placed in that part of the building which will provide the best natural lighting. Where natural light is not available in satisfactory quantities, good artificial lighting must be provided. Related business subjects should be grouped in the same part of the building.

Intra-Departmental Arrangement

Proper arrangement of space within the department is essential for attaining maximum efficiency. The department should constitute an integral unit and should not be divided by a corridor or other rooms

[1] F. G. Nichols, *Commercial Education in the High School*, New York: D. Appleton-Century Company, 1933, p. 97.
[2] National Business Teachers Association, *Eighth Yearbook*, 1942, p. 189.
[3] W. S. Barnhart, "Equipment Standards," *The Business Education World*, Vol. XXV, March, 1945, pp. 351-52.

unless it consists of more than two classrooms and one office or laboratory. The departmental office should be the coordinating center for all business work. Sufficient office space should be provided for each instructor for consultation, possibly located between rooms with connecting doors.

Size of Rooms

Bookkeeping, Typewriting, and *Office Practice Rooms.*—These special business subjects demand rooms larger than standard, approximately a unit and a half. The *bookkeeping room* should be partitioned at the rear for the machine equipment, separated from the main room by a glass soundproofed partition and a connecting door. Both rooms should have access to the corridor. The *office practice room* should not be partitioned. The typewriting rooms should be adjacent to the office practice room so that the facilities of both rooms may be available for secretarial practice classes. The *typewriting rooms* should be one and a half times as long as the standard classroom so that the eye span of the instructor may take in the entire situation from the front.

These special business subject rooms should be equipped with a lavatory since the handling of certain types of duplicating work, changing ribbons, working with carbons, inks, etc., is a necessary part of these courses. Electrical outlets should be installed around the walls near the floor at intervals of six feet to reduce dangers from cords running to desks to provide for voice writing equipment, electric typewriters, bookkeeping machines, etc. as needed. Outlets at the rear of rooms to operate projection equipment should be provided.

Standard size classrooms should be provided for the *other business subjects* which do not require special facilities as to room construction.

Floors, Walls, Ceilings

Floors should be of wood or other non-marking material.

Walls and ceilings of rooms where machines are used should be of sound absorbent material for proper acoustic effect. Soundproofing of typewriting and office machine rooms is necessary. A natural light color should be used for walls and ceilings. Glass brick should be used wherever feasible.

Windows, Shades, and Doors

Windows should be double hung and high enough to keep wind from blowing directly across the desks. The utilization of natural light should be thoroughly

Courtesy of National Education Association



investigated for its proper distribution in the room. It is essential that the mechanical control of shades or other equipment be simple in operation. Provision should be made for darkening the rooms.

Doors should be placed in the rear of rooms. Clear glass should not be used in doors leading to corridors.

Storage Space, Blackboards, Bulletin Boards, etc.

Storage space should be built into the wall below blackboards and into walls not used for the blackboards. It is suggested that:

1. Under the blackboards, doors equipped with built-in locks should open to reveal sliding or adjustable shelves or drawers for the storing of supplies, tests, maps, etc.
2. Elsewhere in the room, when the doors equipped with built-in locks were opened, there would be space provided as follows:
   a. Adjustable shelves.
   b. Drawers of varying depths for storing materials or supplies.
   c. Combined storage and bulletin board under glass, with storage space behind.
   d. Display space behind glass doors, provided with adjustable shelves.
   e. Instructor's closet, including a hat shelf and space for coat to clear overshoes.
   f. Locker space for students' books in machine rooms.
   g. Built-in cabinet for supplies.
3. The spaces for maps should be at least 6 feet long, and as deep from front to back as the wall space will permit up to 24 inches.
4. The other storage spaces should be at least 36 inches wide, 12 inches to 24 inches deep from front to back, with the height the same as that of the blackboards.

Blackboards, with shielded lights, should be across the front of room and along left wall approximately half way back.

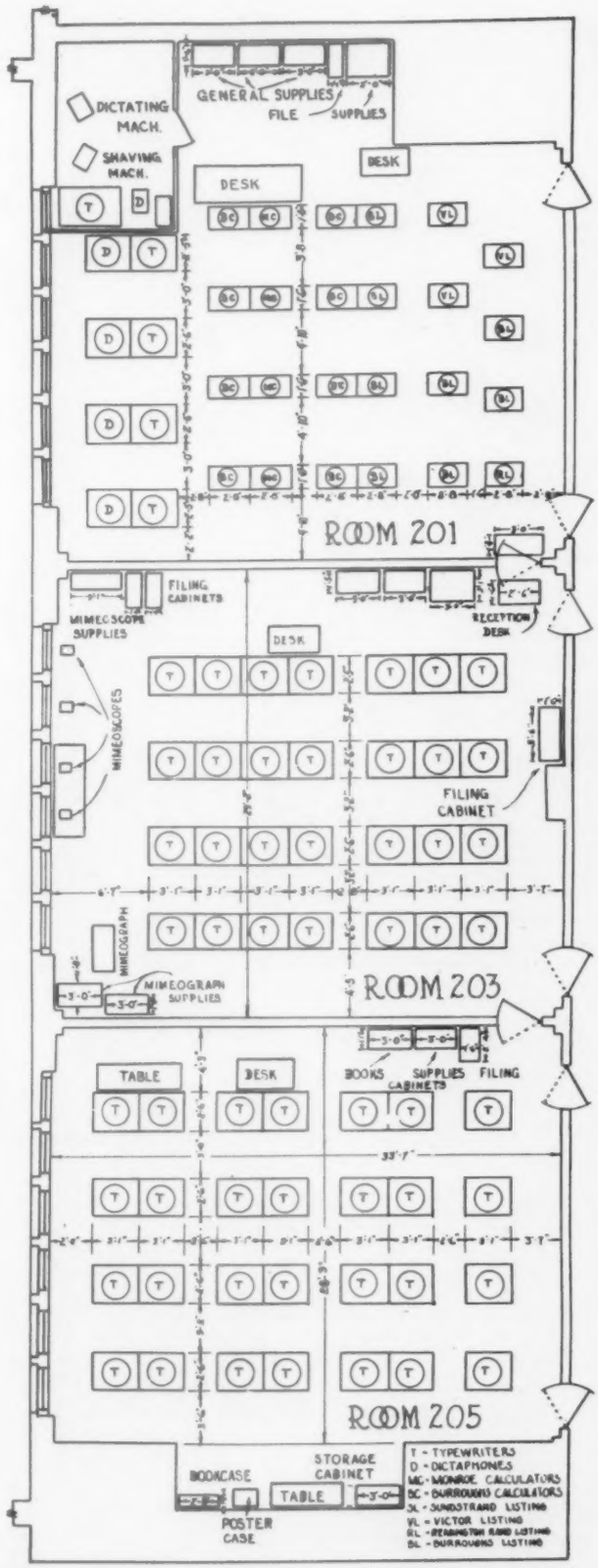
Bulletin boards may be made a part of the doors to storage spaces and be the same height as the blackboards. Cork bulletin boards behind glass and display cases located near the door leading to the corridor are desirable.

Adjustable hangers for displaying maps, etc., along and above blackboards.

Other Building Suggestions

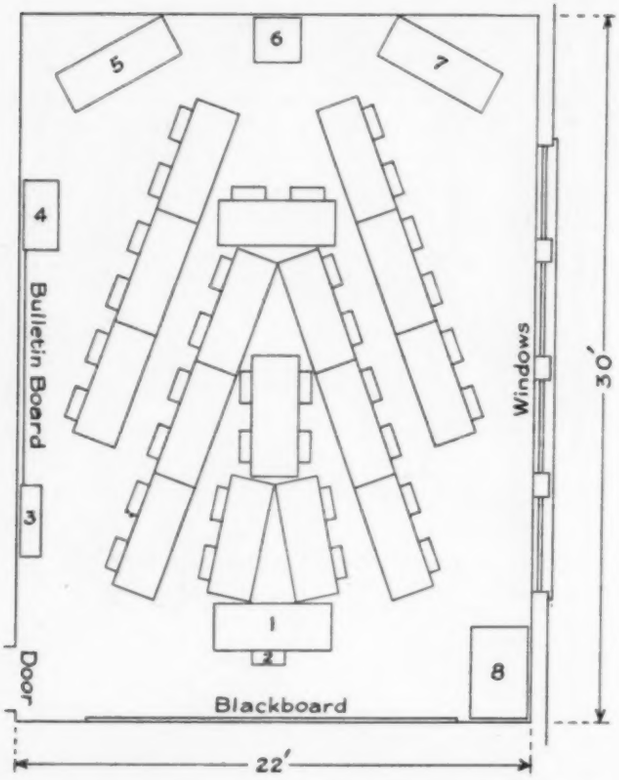
Adequate illumination is necessary for proper conservation of eyesight. The various phases of illumination, such as type of window, proportion of window area to floor space, window sill height, distance from top of glass to ceiling, ratio of window height to room width, windows shades, artificial lighting, height of light fixtures, floor area per light fixture, must all be taken into consideration.

Some division of the total amount of space for the business department must be made, the number and the character of the units being determined by the major objectives, activities, and size of the department. For example, the several activities of the department might include: typewriting, shorthand, bookkeeping, general business training, clerical practice, secretarial office practice, office machines, business law, economics, commercial or economic geography,



Above—Secretarial department, Central Commercial and Technical High School, Newark, N. J. This three-room floor plan permits instruction to be rotated efficiently, even with many students

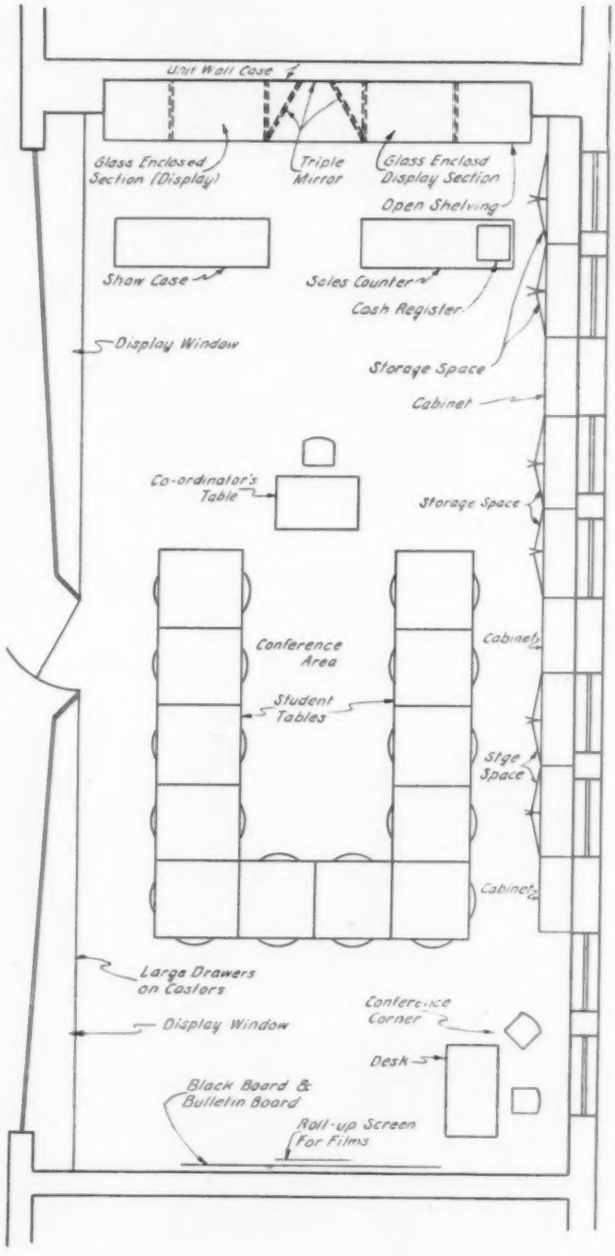
Page facing—Merritt Business School, Oakland (Calif.) schools



Above—Classroom plan for distributive education, recommended by the Georgia State Department of Education. The classroom is designed to accommodate a class of 34 students. The equipment suggested is basic, and it is so arranged that students can view demonstrations from any part of the room without moving from their assigned locations. Note that revolving stools are specified

Legend:

1 Seventeen tables, 5′ x 2′
2 Thirty-five revolving stools
3 Bookcase, 3′ x 1′
4 Magazine rack, 3′ x 1½′
5 Wood sales counter and wrapping desk, 5′ x 2′
6 Vertical glass showcase, 2′ x 2′
7 Horizontal glass display case, 5′ x 2′
8 Three filing cabinets, 2½′ x 1⅓′



Right—Classroom plan for distributive education, recommended by the Illinois State Department of Education

filing, distributive classroom, retail store, and sales laboratory. Many of these groups of activities, as well as specific activities, can be carried on in the same classroom space. There will necessarily be less specialization of space in the small high school.

Since the important consideration is the space for the various business activities rather than the room itself, the approach should consist of the method of providing space for these activities. This requires an analysis and evaluation of the various types of rooms. It is those activities that require a specialized type of space in the school building that present the difficult problems. Those activities that can be and are satisfactorily carried on in the ordinary classroom have been omitted from the foregoing discussion. The difficult problem is to provide adequately for the typewriting, bookkeeping, office machines, and distributive classrooms and their equipment.

Equipment Needs

In building a new home, the architect must know what equipment the housewife wants in her modern kitchen. Likewise, in designing a new school building, the architect must consider the equipment to be used in the classroom. Also, the architect is much more concerned about certain kinds of equipment than others; for example, the dimensions of desks and tables is more essential to *his* planning than the particular make of typewriter to be used on said desk.

There have appeared in business education litera-

ture in recent years frequent articles concerning the layout and equipment for business education departments on the secondary and college level. Many excellent suggestions for the arrangement and organization of equipment in the special business subject classrooms are available for study. The illustrations accompanying this article show either equipment now used or proposed layouts to be used in the future. It should be stated again, however, that until such time as equipment standards for business education are established, we must depend upon a study of the ideas and experiences of others, adjusting them to local conditions.

Employment Community Survey

The extent to which vocational business training for office and distributive occupations should be offered in any particular school, and the specific equipment needed in certain courses, is not debated in this article. However, before the plans for a new building are made, there should be a survey of the business employment community served by the school, so that the business education problems may be better understood and planned. It may well be that such a survey will eliminate the problem of providing instructional equipment for the training of specialized business workers in the smaller schools. On the other hand, such a survey will assist in determining needed equipment for specialized training such as transcribing, calculating, duplicating, and filing; and a distributive training program may include sales laboratory equipment.

Equipment Suggestions

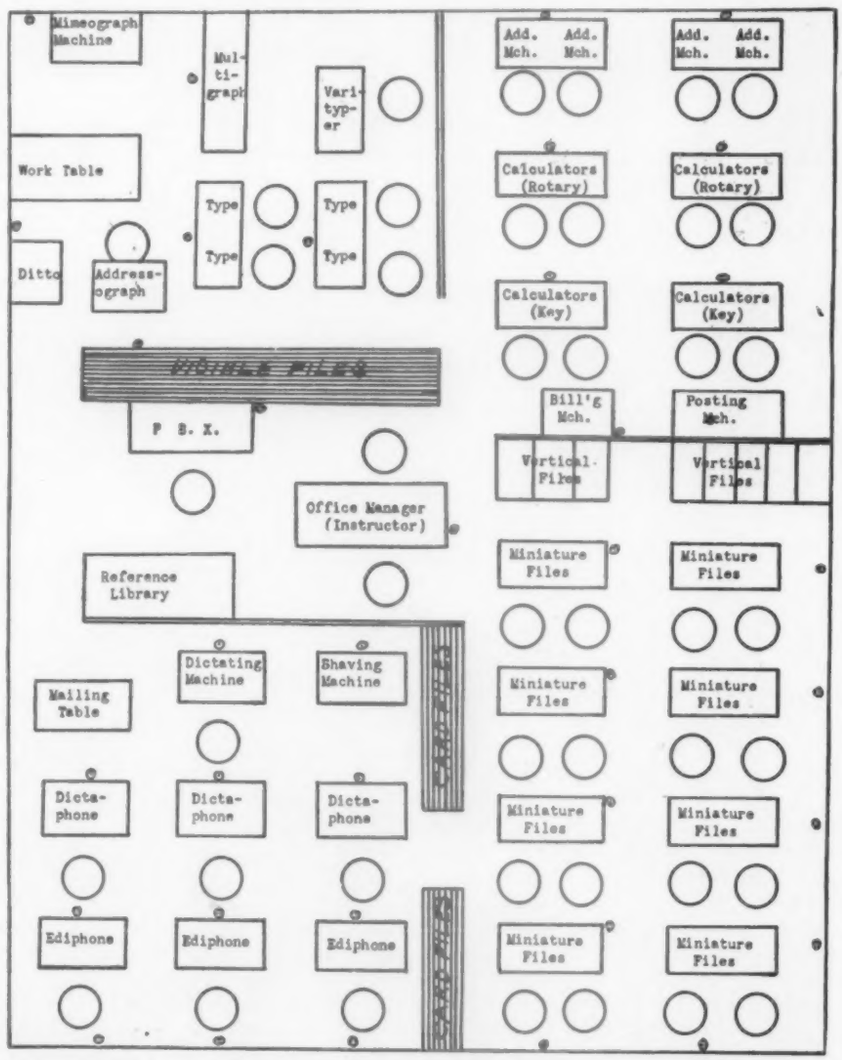
The problem of providing adequate equipment for specialized business training is receiving increased attention. Kyker and Walker [4] have compiled a complete list of equipment, costing approximately $12,000, as a desirable office-training laboratory with facilities to accommodate 24 students per class. Specified are:

44 posture chairs
6 drophead desks
20 linoleum-top tables
1 executive desk
1 P B X unit with 6 outlets
8 4-drawer vertical file cabinets
2 6-drawer visible file cabinets
card files
3 Dictaphone transcribers
3 Ediphone transcribers
1 shaving machine
1 dictating machine
1 electric Mimeograph
1 hand-operated Multigraph
1 hand-operated direct liquid duplicating machine
1 Vari-Typer
1 18-inch carriage typewriter
4 standard pica typewriters
3 noiseless pica typewriters
3 noiseless elite typewriters
2 10-key adding-listing machines
2 selective keyboard adding-listing machines
4 rotary-type fully automatic calculators
2 manually-operated key-driven calculators
2 electrically-operated key-driven calculators
1 billing machine
1 posting machine
12 80-division miniature filing equipment sets
letter trays, numbering machines, postal scales, check protectors, and storage cabinets as needed.

It is obvious that not every school would want to offer such an intensive office training program, yet this list of equipment may serve as a guide for the planning of office training courses. To this list should be added a demonstration table, a valuable instructional aid. Also, it is desirable that chairs and tables or desks be adjustable in height.

[4] B. Frank Kyker, and Arthur L. Walker, "Trends in Business Education," *Office Appliances*, May 1944, pp. 20-22; 24.

Courtesy of Office Appliances



Arrangement suggested by Kyker and Walker for office training laboratory, 40′ x 32′. Larger circles indicate chairs, smaller ones electrical outlets. Two parallel lines show railings, several lines storage counters and files. Typing, adding machine, and filing tables measure 50″ x 22″ x 26″; work table, 30″ x 60″ x 30″. Built-in counters are 18″ or 24″ wide by 36″ high



Left—Community-school canning plant in Chapel Hill, Tennessee. Boys and girls enrolled in home-making classes are taught how to operate canning equipment and process food

Below — School - community canning plant, Winterville, Georgia. The arrangement of plant equipment facilitates operation of an effective training program. Windows on three sides of the building provide cross ventilation and maximum natural daylighting

Photo by G. C. Cook



PLANNING AND DESIGNING PLANT FACILITIES FOR VOCATIONAL AGRICULTURE

By

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And

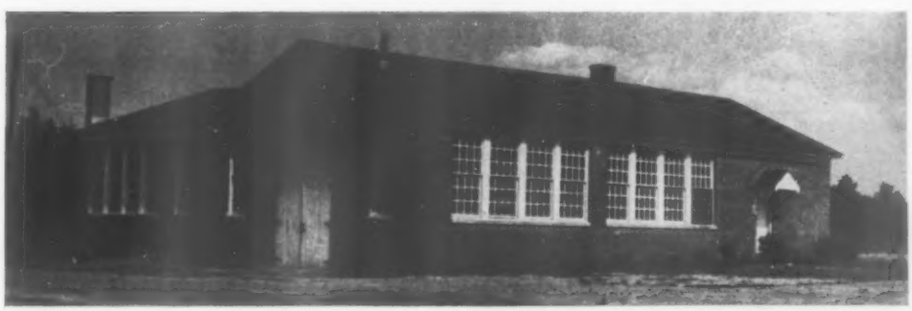
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Classroom and Shop

THE National Vocational Education Act, which provided for vocational education in agriculture on a secondary level, did not provide specific standards for buildings and equipment to be used in the program of agricultural education. State boards for vocational education did not require local boards of education to provide special buildings and equipment to become eligible to receive reimbursement on the salary of the teacher of vocational agriculture. In the early years of the program in agricultural education, a department was usually located in the basement of the high school building where the light was inadequate, the ventilation poor, and the floors detrimental to the health of the students.

The students of vocational agriculture were the pioneers in the movement for separate buildings designed to meet their needs. These young farmers of tomorrow secured abandoned school buildings from the local boards of education, wrecked them, and erected separate buildings for vocational agriculture.

During the "depression" years, public buildings were provided through the assistance of the federal government. Many vocational agriculture buildings, including farm mechanics shops, were erected under this program. This worthy movement brought about a recognition on the part of local boards of education of the need for properly designed buildings for vocational agriculture departments. Today most of the school building planning divisions in the state departments of education provide plans and specifications for vocational agriculture buildings and other buildings to house canning, dehydrating, and freezing

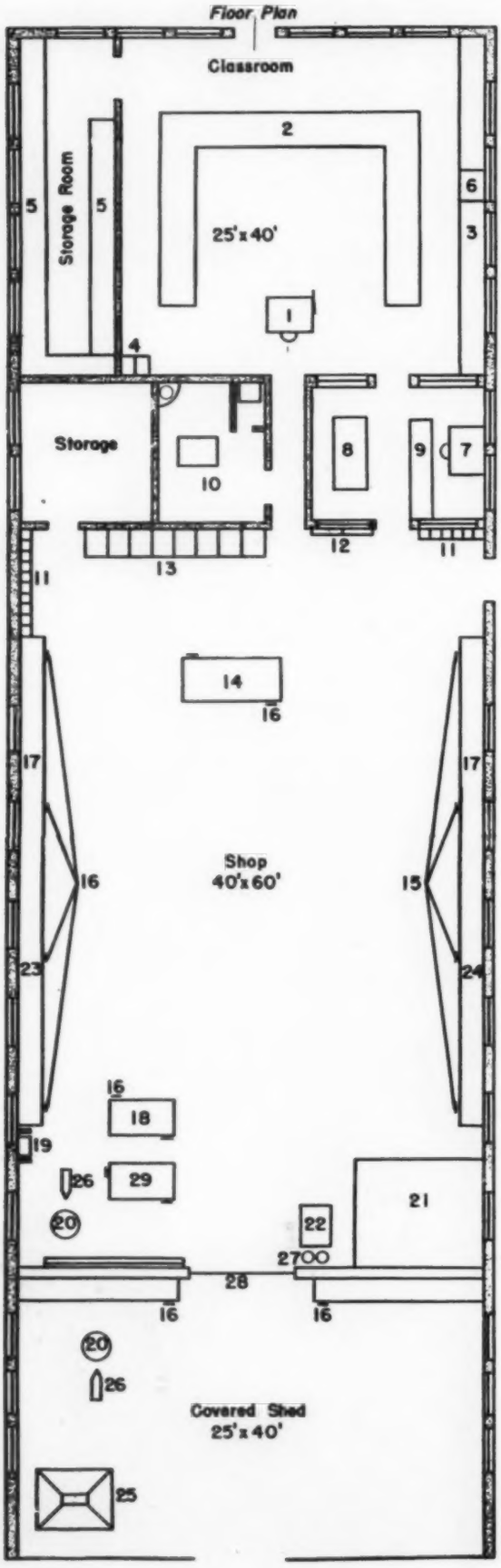


Educators recognize the need for separate, adequately designed buildings for the study of vocational agriculture

Photos by G. C. Cook



Right—Palm trees shade this well-planned building at Plant City, Florida. Above—Vocational agriculture building, Buckingham, Virginia



Suggested Layout for a One-Teacher Agricultural Unit

Legend

1 Instructor's desk
2 Classroom table
3 Laboratory table
4 Bulletin file
5 Shelves
6 Sink
7 Instructor's office desk
8 Small conference desk
9 Counter
10 Washroom
11 Lockers
12 Master tool rack
13 Vertical lumber storage
14 Movable general purpose table
15 Woodworking vises
16 Machinist vises
17 Work benches
18 Soldering bench
19 Power grinder
20 Forges
21 Arc welding booth
22 Welding table
23 Drill press
24 Bench grinder
25 Wash rack
26 Blacksmith's vise
27 Acetylene and oxygen tanks
28 Overhead door
29 Forge bench

Note: Unit tool cabinets at benches. Classroom size includes storage room.

equipment. Buildings for agricultural education have grown from the basement room into a plant which is adequate for the instruction in farm family living.

Many communities are pianning to construct vocational agriculture units in the near future or expand their old plants in order to have adequate facilities for the department. Agriculture buildings will need to be carefully planned to facilitate the training needs of groups requiring the services of one, two, or more teachers. This article is to explain some of the requirements that any vocational agriculture unit should provide regardless of the design used. Elevations are not shown or given because vocational agriculture buildings which are erected will no doubt follow the architecture of the other school buildings. The recommendations included herein are suitable for units of one, two, or more teachers.

The vocational agriculture classroom and the farm mechanics shop should be in one unit. It is recognized that in some parts of the country where an efficient agricultural classroom is already available the shop may have to be a separate unit. In such an instance the farm mechanics shop should be located near the agricultural classroom as vocational agriculture and farm mechanics are closely related.

Adequate storage should be provided for the agricultural classroom and the farm mechanics shop. In a well-planned vocational agriculture unit there is need for two storage rooms. The one for the science room should be adjacent to the classroom. This storage room will be more convenient if it is fitted with shelves and cupboards. The shop storage room should be of adequate size and placed between the shop and the classroom. The shop storage room should be well equipped with bolt racks, shelves, and cupboards.

The instructor's office should be so located as to permit full vision of the activities within the farm mechanics shop and the agricultural classroom. An office placed between the two should have glass on either side to permit the teacher to observe what is going on in both the classroom and shop.

An adequate heating system should be provided. An adequate heating system is necessary for the comfort, health, and good workmanship of the students.

Tables in the classroom should be placed in such a manner as to permit conference procedure.

A minimum of students should face the light. Some prefer the horseshoe arrangement with the instructor's

Suggested Layout for a Two-Teacher Agricultural Unit

Legend

1 Acetylene—arc booth and table
2 Anvils (2)
3 Bookcases (2)
4 Counter
5 Demonstration tables (2)
6 Filing case
7 Floor drains (3)
8 Forges (2)
9 Forge bench
10 Lockers
11 Lumber racks
12 Master tool cabinet
13 Metal storage rack
14 Movable general purpose bench
15 Paint cabinet
16 Power grinder
17 Shelves (2)
18 Sinks with laboratory benches (2)
19 Soldering bench
20 Student tables
21 Toilet room
22 Wash rack
23 Wash sink
24 Work benches (4)

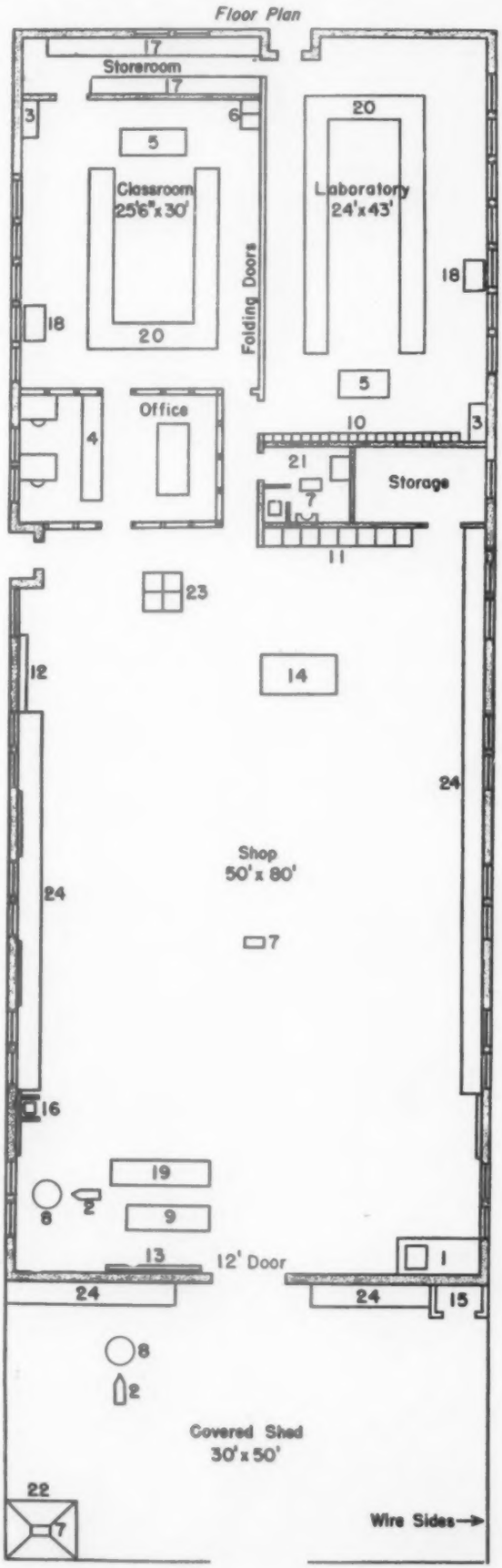


table at the open end. Others prefer the arrangement of one table behind another. Rearrangement of tables is facilitated if they are movable.

In the classroom sufficient space for books, bulletins, and other reference material should be provided. In planning a new building or remodeling an old one, much thought should be given to sufficient and orderly arrangement of space for instructional material.

There should be a blackboard in the agricultural classroom, which is visible from all parts of the room. Provide a sufficient number of blackboards to permit the instructor to illustrate his presentation of a subject. Blackboard space should be provided also for use by the students. The light on the blackboards should be such that writing will be easily read from all angles in the room.

Provision should be made in the agricultural classroom for the efficient use of teaching aids. Provide convenient outlets of proper voltage for the use of slide machines, motion picture machines, and other electrical teaching equipment. Avoid the use of long extension cords with electrically driven machines. A permanent screen for slides, filmstrips, or motion pictures is a time saver. Provision should be made for a permanent place for soil-testing, milk-testing, and other laboratory equipment.

Floors that will permit rugged use and be easily maintained should be provided in the agricultural classroom. The floors in an agricultural classroom generally get hard usage. Bare concrete floors are detrimental to the health of the students. Where concrete floors are provided, a heavy linoleum, such as battleship linoleum, will assure a less tiresome, long-lasting floor that is easily kept clean. Heavy wood floors with a suitable covering also will solve the problem.

Essential utilities which are advantageously placed should be provided, such as hot and cold water, gas, and electricity. At least one demonstration table with water, gas and sink is necessary in an agricultural science room for the teacher and the students.

Proper ventilation should be provided in the agricultural classroom for the maximum number of students using the room. Adequate ventilation is necessary as a safeguard to the health of the students.

The farm mechanics work should be taught in a shop that is used only for that purpose. Farm mechanics needs a plant of its own. It has different objectives, uses different kind of tools, and the proj-

ects are generally of a larger size than those for most other mechanical activities taught in the school. Therefore, this plant should be available to the agricultural instructor at all times.

The floor space in the farm mechanics shop should be left as free as possible from work benches. Place work benches advantageously in the shop to permit the movement of large projects. Farm machinery and equipment require adequate space for efficient work. Provide a sufficient number of benches to facilitate the work.

The benches in the farm mechanics shop should be of a type that fit along the walls. This will leave the maximum floor space available for large farm equipment. Wall benches that measure over two feet in width are a waste of space, and the back of the bench becomes a "catch-all" for scraps of wood, metal, and machinery parts. Benches along the wall tend to be more satisfactory because they are more substantial and have better light if under windows.

The benches used in a farm mechanics shop should not have shelves underneath them. Shelves under the benches in many shops are one of the causes of poor housekeeping. Storage space is always a problem in the farm mechanics shop, but shelves under benches is not the answer.

There should be sufficient light in the building, natural and artificial, satisfactorily located and adequately protected. There must be a sufficient number of windows in the building to provide proper lighting without utilizing the wall space needed for cabinets. Place the windows so they will give the maximum of light and still be located for the minimum of breakage. Where natural lighting near a machine is not sufficient, artificial light should be provided. Place this light high enough above the operator to keep it from being broken but close enough to serve its purpose. Where machinery or motors are being worked on, extension cords will aid greatly in giving light to do a safer and better job. Have protectors on all of the lights that are likely to be broken.

The walls between the agricultural classroom and farm mechanics room should be made as soundproof as is feasible. In departments where two or more teachers comprise the agricultural staff this plan will facilitate the teaching of each phase. Soundproofing will be helpful even in a "one-man" department when some of the students are working in the shop and others in the classroom.

The storage rooms, offices, and utility space should be located between the farm mechanics shop and the agricultural science room. This is a good location for these facilities and provides a buffer for noise between the two types of work. Windows may be placed in the office to allow for vision between rooms. The office should be of sufficient size and fitted to permit conferences between teacher and student.

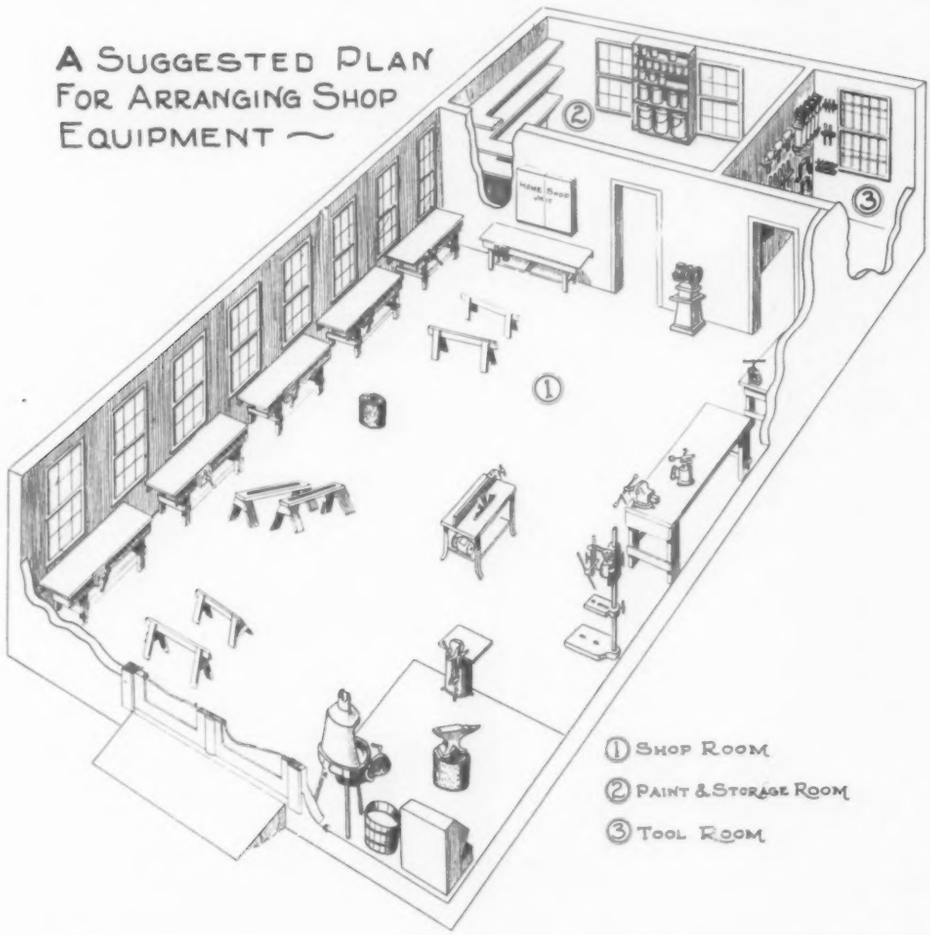
The farm mechanics shop should include at least one door through which large farm machinery can pass. This door should be at least 12 feet in width and 10 feet in height. Where the farm mechanics shop is long and narrow, two 12-foot doors, one at each end, will facilitate the movement of machinery and equipment. A door of the overhead type is probably more suitable than a sliding or folding door. It should fit snugly to aid in keeping the shop warm.

The floor of the farm mechanics shop should be made of concrete or building blocks. The floor should have a gravel or cinder fill underneath the concrete. Since heavy tractors and farm machinery may be



This classroom provides sufficient space for bulletins, books, and reference materials. Individual tables permit student-teacher conference procedure and rearrangement for demonstration purposes

Courtesy of J. K. Coggin, State College of Agriculture, Raleigh, North Carolina



This general arrangement plan was suggested by the Division of School-house Planning, State Department of Public Instruction, North Carolina. Separate work benches are suggested here in place of the one long wall bench. They provide opportunity for group work in repair and construction

placed upon it, the concrete should be five inches thick. The floor will have a better appearance and will be easier to keep clean if it is painted. When tractors or other farm equipment have tracks or lugs, make provision to protect the floor. Wood building blocks placed on end form a lasting floor and one that is more comfortable to stand on for long periods of time.

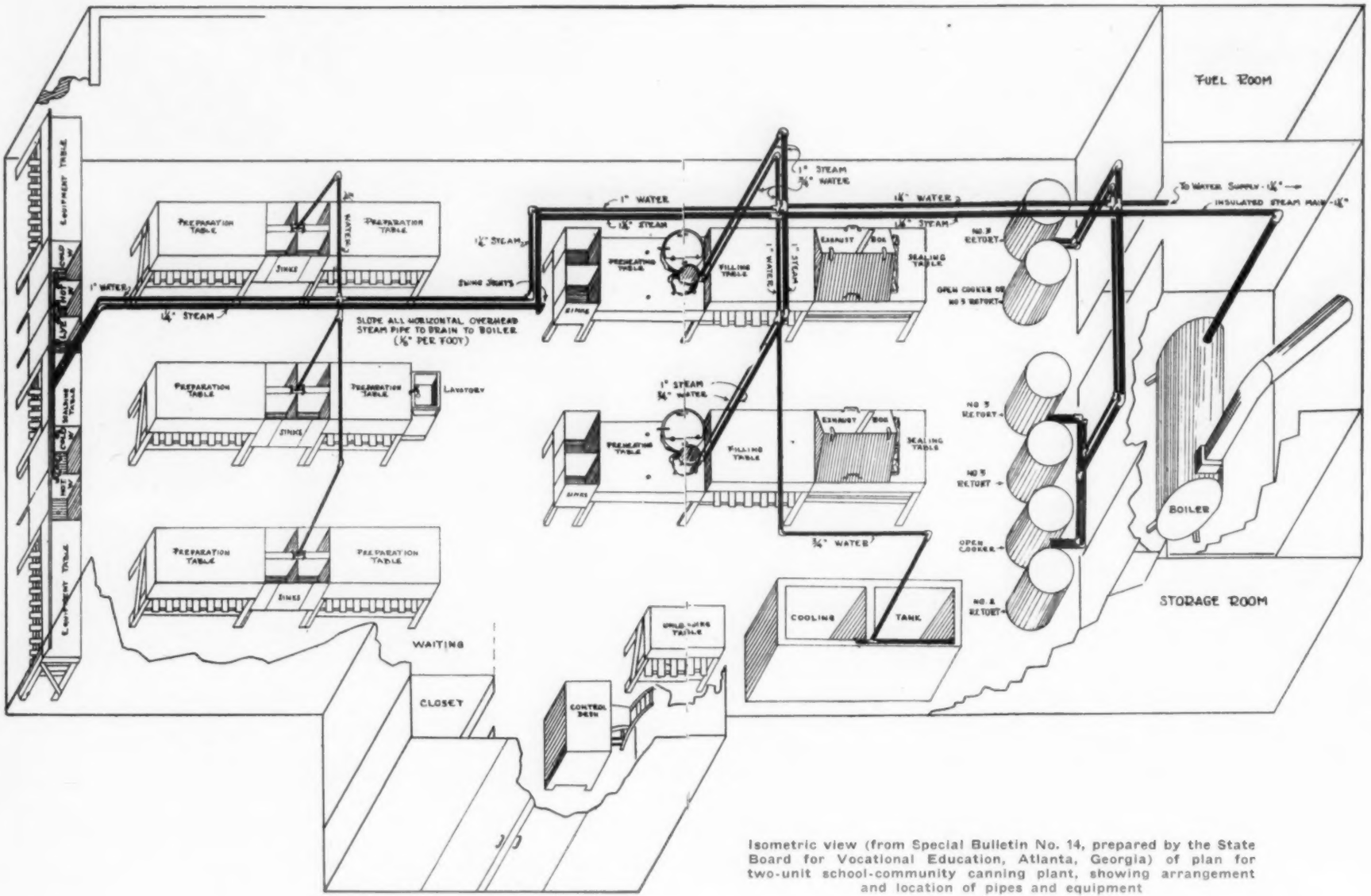
Wall space should be allowed for tool cabinets, such cabinets to be on a unit basis and placed advantageously for the work to be performed. No space should be taken from the farm mechanics shop for a tool room. Plan space for locating windows, benches, and doors to permit tool cabinets to be satisfactorily placed. Provide cabinets for each type of tools, such as wood working, metal working, concrete and automotive. All tools should be placed over silhouettes to facilitate the return of tools to their proper places. These cabinets will be of maximum service if they are located near the work that is to be performed. Tool cabinets will protect equipment as well as any other system.

The building should be so planned that it can readily be enlarged. This is a very important feature. No one knows how large a building will be needed in the future. The site should be large enough to permit expansion. The buildings should be placed in such a manner that there is room for expansion.

Storage space should be provided for coal, lumber, iron, steel, machinery parts, and other commonly used items. The roof should be high enough to permit the placing of lumber in vertical (45 degrees) storage rather than horizontal storage. This type of storage decreases the warpage of lumber. Vertical storage also requires less space in the shop. A small supply box for coal near the forge is necessary. Larger quantities of coal should be stored elsewhere. Storage racks for iron and steel should be near the place where they are to be used. Some state laws require paint to be kept in a fireproof room which has an outside door. Storage bins should be provided for machinery parts.

A covered shed in connection with the shop should be used for storing farm machinery, before and after reconditioning, and for other large construction jobs. A covered shed will aid the vocational program by providing needed storage for the least amount of money that can be put into a building. Farm machinery which comes to the shop for reconditioning, repair, or demonstration can be stored in this shed. When in the shed it can be cleaned and otherwise prepared for work to be done in the shop. The covered shed, in some seasons of the year, makes a good place in which to construct small portable buildings. Protect whatever farm equipment is stored in the shed by a heavy wire fence.

A farm machinery wash rack with drain should be provided and located near the covered shed. The wash rack will probably be located in the covered



Isometric view (from Special Bulletin No. 14, prepared by the State Board for Vocational Education, Atlanta, Georgia) of plan for two-unit school-community canning plant, showing arrangement and location of pipes and equipment

shed. Most farm machinery that comes from the farm will have dirt and grease on it. Before an efficient job of reconditioning can be accomplished, the dirt and grease must be removed. A basin collecting type of drain is most satisfactory with a wash rack. A pressure washing machine will be helpful but is not absolutely essential.

A washroom with toilets and clothes lockers should be provided. Farm mechanics will cause most boys and farmers to get dirty. Coveralls or old clothes will be worn by students. In order to keep the farm mechanics shop neat and to keep the loss of clothing at a minimum, lockers are necessary. A shower may prove helpful, but it is not essential where schools have such facilities conveniently available. Separate toilet facilities should be provided where there are evening schools and other functions attended by mixed groups.

There should be a floor drain in the farm mechanics shop. Even though farm machinery is partially cleaned before it comes into the farm mechanics shop, the floor will become soiled. The easiest and quickest way to do a good job of cleaning the floor is to flush it with water. In some large shops it may be necessary to have more than one drain.

Racks for metal should be located along the wall in a convenient place. In farm mechanics shops much mild steel is used in the repair and construction of farm equipment. This mild steel can be stored neatly and conveniently if racks are provided along the wall near the place it is to be used. Where facilities permit, iron may be stored vertically. A junk heap is unsightly around a school shop. Even though scraps are used in farm mechanical work, the metal should be sorted, segregated, and stored. Steel plate is heavy and hard to move, but it will be more usable if it is lined up against the wall within the building.

Provision should be made for lifting and moving of heavy items within the farm mechanics shop. Many accidents will be avoided if facilities are provided for moving heavy pieces of equipment. An overhead beam (or beams) with a chain hoist provides a good means of doing the job but is probably the most expensive way of accomplishing it. A crane made by commercial companies also will be a satisfactory way of lifting and moving heavy objects. Many farm mechanics shops have built "A" frames on heavy casters which have a chain hoist on them for this purpose. The "A" frame is not only inexpensive but will prove indispensable in the farm mechanics shop.

When arc and acetylene welding equipment is available it should be portable. Most of the farm mechanics shops have either the oxy-acetylene or the arc welder as a part of the regular equipment, and some have both. The acetylene torch shou'd have the tanks mounted on a hand truck which can be moved about the shop. It will be convenient to have this torch towed behind a pickup truck for use on jobs outside the shop. The tanks must be clamped securely on the truck because injuries to persons and the equipment may occur if tanks are dropped. The arc welder may be portable, but that is not absolutely essential. Adequate individual shields for arc welding and goggles for oxy-acetylene work are absolutely necessary.

An exhaust fan for ventilation should be installed in the building. Better working conditions can be maintained with the aid of a ventilating fan. Either the pressure or exhaust type of ventilation may be used.

Electric convenience plugs should be sufficient in number and satisfactorily located in the farm mechanics shop and the agricultural classroom also. Many auxiliary pieces of equipment may be used if convenience outlets are available. Milk tester, slide machines, motion picture machines, electric drills, trouble lamps, and air compressors are examples of auxiliary equipment that is commonly used in the agricultural unit. A good place for such equipment is along the wall and above the benches. Install convenient outlets for both 110 and 220 volts in the building.

Safety features should be provided throughout the building. Guards should always be provided and used on equipment. Chips of wood or metal must be kept off the floor. Proper lighting will help keep down accidents. Statements in this article have been made in recognition of the varied conditions prevailing throughout the country.

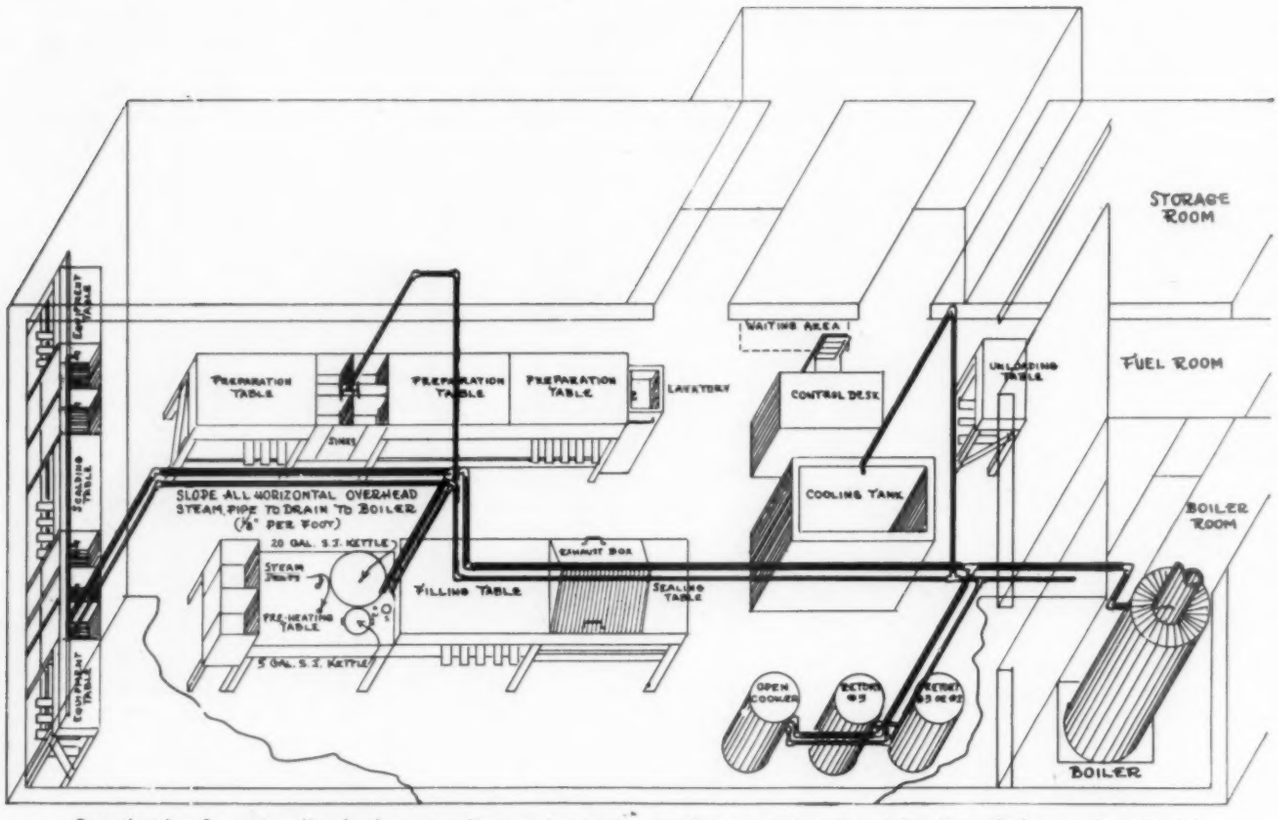
The School-Community Cannery

IN many schools the school-community cannery is considered an integral part of the vocational agriculture and homemaking departments. When the schools are in session, the boys who are enrolled in vocational agriculture and the girls who are enrolled in the homemaking classes are taught how to operate the canning equipment and how to process the food needed to provide an adequate diet. During the summer, fall, and early winter, farmers and their wives, along with the vocational boys and girls, are taught how to use the canning equipment to process fruits, vegetables, and meats needed to supply their families. The local school takes the initiative in establishing the school-community cannery.

Funds to build and equip school-community canning plants have come from sources such as local schools—for the buildings and usually some of the equipment; local contributions—for labor and material; and state and federal aid—for a part of the equipment.

School officials will need to make several decisions in selecting the site for the school-community canning plant. It is very important that the plant be located on the school ground, provided adequate space, a sewage disposal system, water supply, and electricity are available. The building may be connected with the vocational agriculture and/or home economics buildings or it may be a separate building. Other factors, such as convenience to patrons, parking area, cost, appearance, ventilation, drainage, road dust, and the relationship of canning to other school activities, should be given consideration.

The building proper, which houses the equipment, has a strong influence on the successful and efficient



Georgia plan for one-unit school-community canning plant, showing arrangement and location of pipes and equipment

operation of the canning equipment. The size and shape of the cannery building will be largely determined by the kinds and quantity of products to be canned, the number who are to use the cannery at one time, and the type and arrangement of equipment. School-community canning plants now in operation vary in size from 20 to 40 feet in width and from 40 to 70 feet in length. Most school-community canneries now being constructed are 30 x 70 feet. A building of this size will house three complete canning units and will accommodate approximately thirty people at one time and have a processing capacity of 2500 to 3000 cans per day.

The choice of the material to be used in the structure of school-community cannery buildings will be determined by such factors as the part of the country in which the building is being constructed, local cost of materials, and the type of the other buildings on the school grounds. The foundation of the building and the floor should be made of concrete. The walls of the newer type buildings are usually constructed of concrete cinder blocks, brick, or wood and are usually about ten feet high from finished floor to ceiling. The inside surfaces of the wall should be smooth and non-porous for cleaning, and painted. Most of the newer-type buildings are not ceiled as better circulation of air is provided so that steam can escape more easily through ventilators in the roof. The roof is usually supported by clear span wood trusses. Composition shingles are quite generally used for the roof covering.

For proper floor drainage, the pitch from the wall to the drain should be approximately one inch for every ten linear feet. Open drainage troughs located under the preparation and filling tables are generally used as they provide good drainage and are easily cleaned. The trough openings between the preparation tables and other work areas are covered with a metal slab or a 2 x 8 inch or 2 x 10 inch board which is placed on shoulders in the trough and permits the covering to be on a level with the floor.

Due to excessive heat in most canning plants during the summer months, proper ventilation is very important. Ceilings are usually omitted to allow hot air to rise into the roof area where it is removed through long louvered ventilators or forcibly withdrawn with exhaust fans located in the gable ends of the building. Windows arranged to take advantage of prevailing winds and preferably located on three sides of the building provide good cross ventilation of fresh air through the building. The windows should be installed to open from the top and bottom. All windows, doors, and other openings should be tightly screened with 16 mesh wire.

Natural daylight will provide most of the lighting normally used in the canning plant. Long windows should be used and placed near the top of the side walls. This will provide maximum light penetration to the center of the plant. In addition to natural lighting, it is necessary to have the building wired so that lighting fixtures are located directly over all work areas.

Facilities for heating the cannery building should not be overlooked. A blower-type heating unit oper-

ated from the steam boiler will provide adequate heat.

The toilet and lavatory facilities of the school are usually made available to patrons of the cannery. However, when they are not available, these facilities, properly segregated from the canning area, should be provided.

Storage space for empty cans should be provided in the cannery building. This storage space should be separated from the working area to keep the tin cans from coming into contact with steam which will cause them to rust.

Some factors to consider in determining the kind and amount of equipment to procure are: the number of persons to be trained, the amount of produce to be canned, the limited growing season in some areas, the number of different kinds of products to be canned during any given day, the number of hours the cannery is to be kept open each day, and whether or not the plant is to be used in connection with school lunch programs.

Each piece of equipment should be arranged in its proper place to permit an effective training program, plant efficiency, and smooth operation. When placing the equipment in the work space or area required for its successful operation, one should keep in mind its relation to the sequence of the canning procedures. A successful sequence of operation is one that permits a steady progressive flow of products from the receiving area through the various necessary steps of washing, preparation, filling, exhausting, sealing, processing, and cooling. The installation of equipment should be made to allow for this progressive flow of produce and to permit patrons to move from one operation to the next with little lost motion.

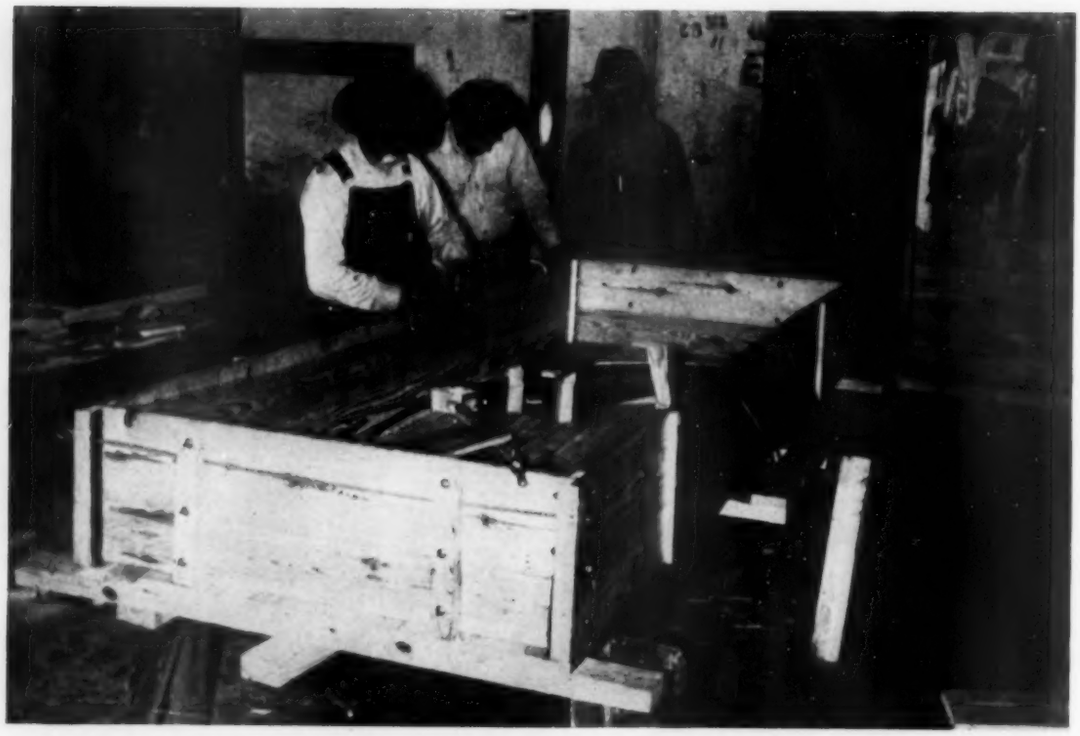
Standard-make steam and water pipe, valves, and fittings of known strength test should be used. Careful consideration should be given to the selection of materials used in the installation of high pressure steam boilers and other equipment. The connecting steam line, extending from the main line to the piece of steam equipment, should be the size of the tapping provided by the manufacturer of such equipment. Equipment such as retorts, steam-jacketed kettles, and overhead coils are classified as unfired pressure vessels. Unless it bears the seal of the National Board of the ASME, no attempt should be made to operate it on high pressure steam. If not built in accordance with the code, a pressure reducing valve should be installed in the line which supplies steam to this equipment.

The canning plants should be equipped with hot and cold water vats, lye vats, preparation tables, wash sinks, blanching vats, filling tables, steam-jacketed kettles, exhaust boxes, sealing tables, hand and electric sealers, No. 2 and No. 3 size retorts, open hot water bath cookers, cooling tanks, and a 15 to 25 horsepower size boiler. In addition to this equipment, pots, pans, knives, thermometers, gloves, garbage cans, trays, and labor-saving devices such as pea shellers and corn cutters should be provided.

PLANNING SCHOOL-COMMUNITY FARM SHOPS

By A. O. DUNCAN

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Farmers construct a wagon box in a school shop under direction of the teacher of vocational agriculture

SINCE the beginning of vocational agriculture in 1917 farm shop jobs have been included in the learning programs of farm boys and adult farmers. In order to give shop instruction efficiently, many states of the nation have already constructed and are operating a large number of school-community farm shops.

In the United States during the 1943-44 fiscal year, farm boys, who were enrolled in classes of vocational agriculture, constructed 95,932 items of farm equipment and repaired 245,807 farm machines as a part of their farm shop training program. During this same year, farmers were enrolled in 47,765 courses in farm shop and 512,114 courses in farm machinery. School farm shop facilities were used in teaching these boys and farmers. Still, not all farm boys and farmers are receiving adequate instruction in farm shop jobs. Additional equipment and buildings must be provided in order to meet a growing need for this type of instruction.

The use of farm shops in schools has taught us that there are several important problems in establishing them that should be considered. These problems are: (1) what place to give school-community farm shops in the future, (2) what equipment to provide for the shops, (3) how to arrange the equipment in shops, (4) what kind of shop buildings to construct, and (5) how to care for shop equipment and tools.

Farm Shops in the Future

The program of vocational agriculture is operated on the point of view that schools should provide facilities and instruction for training farm boys and farmers to cope with the problems with which they are confronted. Many of the farmers' problems lie in the field of constructing and repairing items of home and farm equipment.

The scarcity of new farm equipment and the present condition of old equipment because of the war magnifies the need for instruction in repairing farm machinery. Then too, since the war has ended and farms are becoming more and more mechanized, there will be an increased use, by farm families, of farm equipment and labor saving devices. Farm people should be taught how to use, how to care for, and how to repair this expensive modern equipment.

Also, the scarcity of materials has delayed the repair of farm buildings and the construction of many items.





Vocational agriculture buildings housing farm shops. The shop is attached to rear of the building at right

There will be a great need for giving instruction in making and repairing the much needed home and farm equipment as soon as materials become available.

For the next few years veterans will enroll in Veterans' Farmer Training Courses that are offered in the departments of vocational agriculture in our high schools. The training program will be based on the needs of veterans living on farms. Therefore, much of the training program will include farm shop jobs.

A large percentage of the farm boys in vocational agriculture classes will go into mechanized farming and, therefore, need training in repairing farm machines. The census data show that a large portion of farm boys also go into industrial occupations. Farm shop training is likewise valuable for this group of boys.

To meet all the demands of present and prospective farmers, the farm shop training aspect of our program of vocational agriculture should receive first emphasis for several years in the future. Many additional well-equipped school-community farm shops should be established and used in the instructional programs of vocational teachers.

What Equipment to Provide

School farm shop facilities may be classified into several groups, such as: woodworking power tools, woodworking hand tools, forge shop tools, welding and soldering tools and equipment, mechanics' tools, plumbing tools, and painting facilities. The emphasis on each of these groups will depend on the set-up on farms of the community and, consequently, the nature of the instructional program.

Most communities and schools that provide vocational agricultural instruction should have a well-equipped farm shop including all of the groups of tools indicated. Some may have farms with an abundance of machinery on them. Therefore, metal-working shop tools should be emphasized for these communities. Others may need more repairs of buildings and construction of home and farm equipment and should have a good woodworking shop.

After the type of shop and the particular groups of equipment have been decided on, it is then necessary to select the specific items of equipment and tools for the shop. It is the plan here to suggest tools for the well-equipped school-community farm shop.

How to Arrange the Equipment

Many schools have good shop equipment but the arrangement is such that it cannot be efficiently used. Farm shop specialists have given a great deal of thought to a good arrangement for school shops. They agree that convenience and safety shou'd receive pri-

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TOOLS FOR THE SCHOOL-COMMUNITY FARM SHOP

Wood Shop Power Tools and Accessories

1. Two H.P., twelve inch arbor or circular saw with a rip blade, cross cut blade, dado heads with insert, a C-clamp, and a safety push stick.
2. Eight inch jointer with extra knives, a push stick, and 2 six inch C-clamps.
3. Sixteen inch band saw with extra saw blades of ¼, ½, and ¾ inch sizes.
4. Drill press (½ inch chuck) with a set of 1/16 inch to ½ inch high speed bits, ⅛ inch to 1 inch spur bits, mortising attachment with ¼ and ½ inch bits and chisels, two 5 inch C-clamps, oil can, and a speed table.
5. Stationary sander with assorted sheets of sand paper, and portable sander with assorted sand paper bands.
6. Ten inch 1 H.P. tool grinder with 24, 60, and 100-grit grinding wheels, a tool sharpening gauge, coarse and fine wire brushes, safety shields, and machinist goggles.
7. Individual wall cabinets for storing the accessories for power tools.

Heavy duty equipment should be provided. If money is scarce it would be better to purchase fewer items of adequate size rather than a large number of small items. Usually only one machine of each kind is necessary for a school shop.

Wood Working Hand Tools

	Number of Items
1. Hand Saws:	
26 inch 10 points cross cut saws	2
26 inch 8 points cross cut saws	4
26 inch 7 points rip saws	1
Coping saws with 12 extra blades	2
Pistol grip saw sets	3
2. Nail Hammers and Hatchets:	
16 ounce hammers	6
13 ounce hammers	3
3½ inch half hatchets	3
3. Squares:	
Framing squares	6
8 inch try squares	6
8 inch sliding T bevels	3
12 inch combination squares	3

	Number of Items
4. Measuring Devices:	
50 foot steel tapes	2
6 foot rulers	6
Marking gauges	3
8″ to 10″ dividers wings	1
Trammel points	1
Bob and plumb	1
5. Planes and Bits:	
14 inch jack planes and bits	2
9 inch smoothing planes	2
6 inch steel block planes and bits	2
Spoke shavers	2
6. Files:	
10 inch flat wood files	2
8 inch half round files for wood	2
Auger bit files	6
Hand saw files	6
10 inch round tapered files for wood	2
7. Braces and Bits:	
Auger bits ¼″ to 1″ by 16ths	1 set
Expansive bits ⅞″ to 3″	1 set
Gimlet bits (assorted)	12
Screw driver bits ¼″ to ½″	4
10 inch ratchet braces	4
8 inch countersink bits	2
8. Chisels and Screwdrivers:	
Wood chisels ¼″ to 1½″ by 4ths	2 sets
Screw drivers—3″ to 10″ shanks	2 sets
9. Portable Drills:	
⅜ inch chuck yankee hand drill	1
Round shank twist drills—1/16″ to ¼″ by 32nds	1 set
Screw extractors	1 set
10. Clamps:	
Bar clamps (two 3″ and two 8″)	4
10 inch hand screws, wood	4
C-clamps 4″ to 10″ by twos	2 sets
11. Abrasives:	
Pumice stone	11 lbs.
8″ by 2″ carborundum oil stones	4
9″ by 11″ sand paper, No. 0, ½, and 2	18 quire
9″ by 11″ emory cloth, No. ½	1 quire
12. Other Items:	
Wood working tables equipped with vises (See Plan)	4
¾″ by 30″ wrecking bars	2
½″ by 15″ wrecking bars	2
26 inch levels	3
8 inch draw knives	3
6 inch pliers	3
8 inch pliers	3
Oil cans	3
Putty knives	3
10 inch trowels	3
Concrete edgers	1
4″ by 14″ floats	1
Concrete groovers	1
Forge Shop Tools	
Electric blowers with variable speed switch and two tuyere irons	2 each
Drill press vises	1
Blacksmith's vises	1
160 pound steel face anvils	3
Hardies to fit anvils	3
Anvil, guard and sickle	1
32 ounce blacksmith's hammers	3
12 ounce machinist ball pin hammers	3
20 inch straight lip tongs	3
20 inch curve lip tongs	3
Aligning punches	3
Starter punches	3
Sheet metal, pin punches	4
⅛ inch punches	3
12 inch hack saws with 12 extra blades	4
Saw plate set—N.C. and N.F. ¼″ to ¾″ by 16ths	1 set
Portable 1½″ by 10″ grindstone with motor or water grinder with motor	1
Sickle grinder—¾″ shaft	1
Grinding goggles	4
Power hack saws	1
Post drills	1
Tubular riveters	1
No. 4 and No. 5 rivet sets	2
Nail nippers	1
10 inch bastard files	4
12 inch bastard round end files	2
5½ inch stem taper files	6
10 inch and 12 inch flat files (metal)	4 each
10 inch mill files (metal)	4
⅝ inch high speed center reamer	1
Work benches	2
4½ inch machinist vises	1
30 inch bolt cutters	2
8 inch slip joint pliers	4
8 inch and 12 inch monkey wrenches	2
Open end wrenches, ⅜″ to 1″ by 32nds	2 sets
Hot and cold hand chisels, ⅝″ to 1″	4 sets
Blacksmith's hand chisels, 1⅛ inch hot cutter and 1½ inch cold cutter	2 each
Adjustable wrenches, one 6″, two 8″, two 12″, and one 15″	6
Welding Equipment and Tools	
Acetylene-oxygen welder mounted on truck	1
Electric welder	1
Welding tables	2
Heavy duty 1½″ by 8″ wheel grinder	1
Grinding wheel dresser	1
C-clamps 6 inch and 10 inch	4 each
Goggles for acetylene welding	8
Hoods for electric welding	8
Chipping hammers	2
Hack saws (12 extra blades)	2
Cold chisels	4
Steel brushes	3
Other tools listed under forge tools	
Soldering Tools	
Soldering coppers	4
Blow torches	4
Non acid solder	6 lbs.
Acid for soldering	1 qt.
Tinner's snips, two 12″ and two 8″	4
3 inch circular cutting snips	2
½ inch cold chisels	2
Other equipment used for welding and forge work	
Mechanics' Tools	
Chain hoist on portable stand	1
Monkey wrenches	3
Sets of socket wrenches (assorted sizes)	4 sets
Sets of open end wrenches, ⅜″ to 1″	4 sets
Lever type alemite guns	1
Speed indicators	1
Two to three ton jacks, floor and hydraulic	2
Trouble lamps and drop cord	1
Gear pullers	1
Adjustable pliers	3
7 inch diagonal pliers	3
8 inch long nose pliers	3
Linemans' side cutter pliers	2
Water pump pliers	1
Spark plug wrenches, ½″ to ⅞″ by 16ths	1 set
Inside and outside calipers	1 each
Auto creepers	2
Thickness gauges	1 set
Screw drivers (in wood shop)	
Other tools in forge shop	
Plumbing Tools	
Receding ratchets	1
¼″ to 2″ pipe cutters	2
½″ to 1¼″ pipe stock and dies	2 sets
¼″ to 1¼″ pipe reamers	2
½″ to 2″ hinged pipe vises	1
Pipe wrenches, one 24″ and two 14″	3
Hack saws with extra blades	4
Painting Facilities	
Steel brushes	4
Steel scrapers	4
1″, 2″, 3″, and 4″ paint brushes	4 each
Putty knives	6
Sand paper, No. ½	3 quire

mary consideration; also, that the arrangement should eliminate confusion when the pupils of a class are using different items of equipment at a given time and prevent the movement of pupils through aisles which would interfere with the use of power equipment.

In the accompanying diagram which illustrates a desirable arrangement of shop equipment, it should be noted that the power tools, work benches, cabinets, and storage room are located in one end of the shop building. This woodworking section is divided into two areas—one for the preparation of materials and the other for finishing the job. The other end of the building contains the forge shop and related equipment used in welding, plumbing, machine repair, etc. One important feature of the arrangement is that no items of permanent equipment are stationed in the large work area in the center of the shop.

When the equipment is to be fitted into a building that is already constructed, a drawing of the floor plan, showing the equipment arranged in the same relationship as in the diagram, should be made. The equipment should be set up to scale in the drawing, so that outlets and other installations may be indicated and installed before the equipment is placed in the building.

In locating equipment, there are several points to be considered that may not be noticed when studying the diagram. These are as follows:

Woodworking Equipment

The lumber rack and saw horses are located in the "Preparation Area" of the wood shop, so that the lumber to be used by pupils may be selected, pulled out, and sawed to the proper length before being prepared by the power equipment. The rack should be placed adjacent to the large door for convenience in unloading and storing the lumber.

The arbor or circular saw and the jointer should be located near enough the windows to provide natural light but at sufficient distance from the wall to provide for convenience and safety in handling long boards. Also, there should be room in front and in back of these two items of equipment for ripping and sizing long boards. They should not be in line with the doors but should be slightly to one side of the shop center.

The drill press, equipped with mortising attachments, is used in woodwork and in metal work. Therefore, it should be convenient to both the woodworking and forge areas. When used for mortising, the drill press should have several feet of clearance on each side, as the back is turned to the wall.

The band saw is used for cutting circular braces and other items that are to be used in finishing a job. Therefore, it should be in the vicinity of the work benches. It should be turned so that the aisle will be behind the operator when using the saw. At least four feet clearance should be provided on each side.

The work benches should be portable so that they may be used next to the wall or moved into the work area in the center of the building. Each work bench should be equipped with woodworking vises. Woodwork benches should never be used as stands for jointers, grinders, and such items of equipment.

There are three methods that might be used in storing tools—tool room, tool cabinets, and a combination of tool room and tool cabinets. The last seems to be the most liked by teachers. Tools that are used frequently and accessories to large equipment should be stored in the cabinets. Tools that are used seldom and large tools that would occupy too much cabinet space should be stored in the tool and supply room.

Individual cabinets for power tool accessories should be placed on the wall near the power tools.

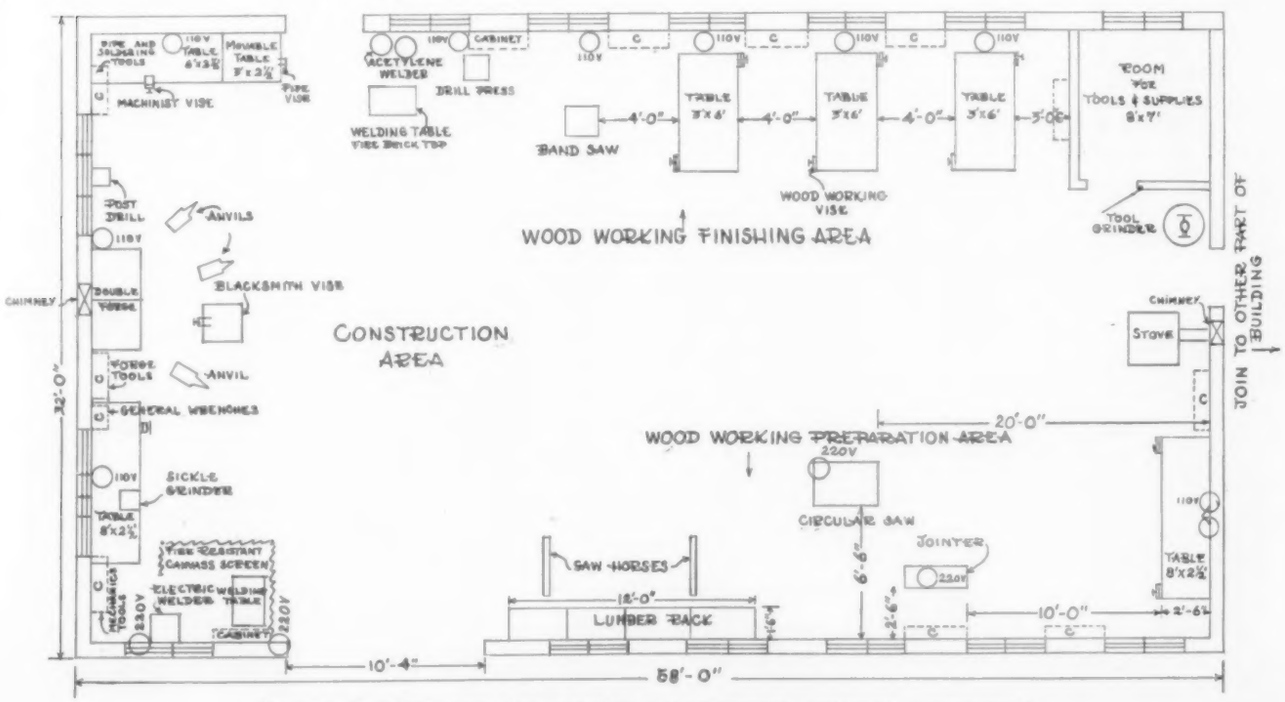
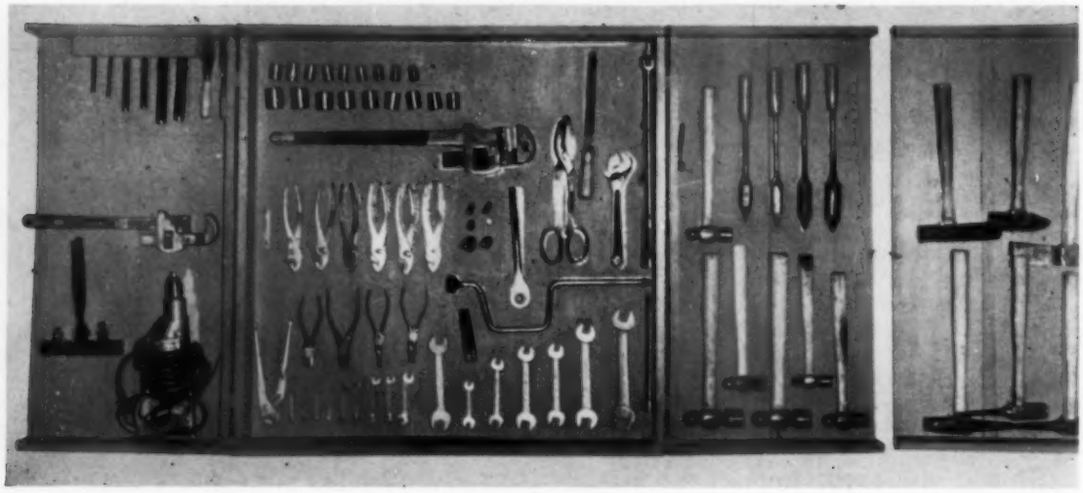


Diagram of school farm shop, showing a recommended equipment arrangement



Individual tool cabinet for storage of tools and attachments

Woodworking tool cabinets (3′ x 3½′ x 9″) should be mounted on the wall adjacent to each work bench. The cabinets should be fastened on the wall with the bottom approximately four feet from the floor so that the cabinet doors may be opened without interfering with the work benches. The storage room should be located as conveniently as possible without occupying valuable space in the center of the shop.

Although a stove is shown in the diagram, a steam heating system with overhead blower units should be used when possible.

Storing Tools in Cabinets or Storage Room

1. Classify all hand tools according to type or use.
2. Arrange each group in separate cabinets, or place together in the storage room based on the use to be made of the tools. For example, all saws should be together. If there is room, all hammers and squares may be in the same cabinet or area with the saws.
3. Make black silhouettes of each tool on a light gray background.
4. Paint a red band on black tools so that they may be conspicuous on the silhouettes.
5. Mount each tool separately—not one on top of the other.
6. Mount sharp edged tools with cutting edge to the back or the side of cabinets to prevent dulling tools and injury to pupils .
7. Mount tools so that they can be easily removed and returned to cabinets or storage room.

Metal Working Equipment

A double forge, along with the electric blowers, are located in one end of the building. A hood for feeding the smoke into a single flue, forced draft chimney should be mounted over the forge. The three anvils and a blacksmith's vise may be accommodated by the double forge. A cabinet for forge tools should be conveniently placed.

The oxygen-acetylene tanks should be mounted on a truck so that they can be moved to large objects to be welded. When not in use, the welder should be stored away from spark-producing equipment.

Since the electric welder is used to repair tools and machines, it should be in the vicinity of the forge and mechanic department. It should also be near the large entrance door for welding work on machinery that is too large to bring into the shop. It should be installed in an area suitable for screening off so that others working in the shop will not be exposed to the glare of the welder.

A chain hoist should be mounted on a portable frame so that it can be pulled into the work area when needed. Wrenches and other mechanics' tools might either be stored in the tool cabinet or mounted on a movable panel. They should be mounted in the method prescribed for woodworking tools.

If the work bench containing the vise for plumbing is movable it can be pulled out to take care of long pipes and, when not in use for plumbing, it can be stored next to the stationary work bench to provide work bench area for soldering and other related work.

Painting Tools

Paint brushes and other tools for painting may be stored in a separate cabinet or in the tool room. Probably the tool room is more desirable because painting equipment will need to be moved to the objects to be painted, which will be either in a separate room or outside of the shop building where they will be protected from dust and will not be interfered with by pupils.

What Kind of Shop Buildings to Construct

It is important that a diagram showing the location of equipment, outlets, etc. be made to scale before the building is planned. The accompanying diagram shows the floor plan, along with the location of windows, doors, etc., for a good school-farm shop. Information on some things to consider in planning and constructing shop buildings follows:

Size and Shape

Because of structural limitations and natural light penetration limits, the width of a shop should be about 36 feet or less, with lengths ranging from 50 feet to 70 feet. At present the average farm shop contains about 1800 square feet of foot area.

Structure and Materials

The structure of the building, and the choice of materials, is determined not only by the strength and safety necessary, but also by its use in connection with the equipment. The building materials and the heating system also are affected by the climatic conditions of the community.

1. *Footings and Foundations.*—Footings are usually 8 by 16 inches and made of concrete (1-2½-3 cement, sand, gravel mixture). They should be placed on solid earth well below the freeze line (2 feet 6 inches to bottom for a low of 20° F.). The foundations on footings should be of masonry or concrete.

2. *Walls.*—All walls must be of sufficient strength to carry the load on them. They may be of brick, concrete, tile, or wood, usually about 10 feet from the finished floor to the ceiling. The choice of roof construction will be between a continuous bearing wall having roof loads uniformly along sides—the usual type 8-inch masonry walls, or a curtain wall type having loads concentrated in the roof to be carried by columns or piers in the walls. Inside surfaces should be smooth and non-porous in order to provide ease in cleaning, and are often painted. If masonry walls are used, through mortar joints should be broken and the outside waterproofed, or a hollow type wall used to reduce moisture penetration.

3. *Roof.*—The roof is usually supported by clear span wood trusses. These may be light trussed rafters spaced about 2 feet apart with the roof decking nailed directly onto them, or of heavier built-up trusses (wood or metal) with light beams between them to carry the roof decking. The latter type must also have light beams or joists to carry the ceiling. Supports for overhead shop tracks carry heavy loads and should be provided for in the design of the roof structure.

4. *Ceiling.*—Ceilings make heating easier, lighting better, help eliminate dust from roof structure, and are more attractive. Celotex type boards or tile, wood, plywood, plaster, or plaster boards may be used. Celotex type ceilings help absorb sound but are more likely to be damaged by bumping with long boards and should be applied on leveled wood strips. Plasters tend to crack under wood trusses as they settle.

5. *Floors.*—Floors are usually of concrete placed on a porous solid fill of 4 inches of gravel, crushed stone, or brick, etc., which rests on firm earth built up at least 12 inches above the outside grade. The floor should be of best quality concrete about 4½ inches thick with a 1-2½-3 cement, sand, gravel mix and 5 gallons of water. The floor should be poured in sections or panels, care being taken that surfaces are perfectly level and true except where drainage areas occur. Where drainage is necessary, the floor should slope without pockets ⅛ to ¼ inch per foot to drains with accessible cast drain grease traps.

As soon as the concrete is stiff but workable, the floor should be finished by using a steel trowel for a smooth finish. A harder, better finish may be obtained by pouring and finishing a ¾ inch topping of 1 part cement to 2 parts sand and a 3¾ inch concrete slab while still workable. If not covered, a concrete floor should be treated with a chemical floor hardener and sealer to prevent dust and stain. Other instructions for making and placing concrete are available from the Portland Cement Association.

In the woodworking and other areas where there is little grease or heat, a covering of asphalt or rubber tile is desirable as it helps to eliminate dust, is easily cleaned, protects dropped tools, and is a more comfortable and attractive surface. It may be applied directly to the rough finished concrete with mastic cement. Asphalt tiles are little affected by moisture.

To allow for uniform settlement, the floor should not be fastened to the walls except by an expansion joint. Expansion joints should be placed at walls and at 40-foot maximum intervals. These may be manufactured mastic strips or tar poured into a ½ inch joint left by a greased-removable strip.

Other Factors

1. *Ventilation.*—Normal window ventilation will be sufficient for the shop except for special conditions such as forge, paint rooms, etc. These require special hoods, vents, or forced ventilation. Windows play an important part and should be large stock size and numerous. Those having 100% free open area when opened are desirable. The bottoms of windows should be about 36 inches to 42 inches from floor to allow the incoming fresh air to start as low as possible and yet be above the table tops.

2. *Lighting and Wiring.*—Natural daylight will provide most of the lighting normally needed. Windows should be long and extend near the ceiling to provide maximum light penetration into the center of the shop. Illumination at the work level should be at least 15 foot candles with few shadows. When necessary, this level of illumination should be provided artificially. Although more expensive, fluorescent-type lighting seems to be the best for shop work since it throws few shadows and gives almost twice the light for the same current used. Three watts per square foot of floor area covered by bulbs, or 1½ watts for fluorescent tubes should be allowed. Full voltage should be available at all sockets under peak load.

All wiring should be of sufficient size and installed by a competent electrician to conform to the National Board of Fire Underwriters' Code. Current should be 110-220 A.C. and should feed in through a master switch, fuses, meter, and other switches as desired. Special outlets for electric welders, saws, jointers, or other heavy equipment should be planned in advance and placed in the floor where equipment is away from the wall. Regular outlets should be located only after shop is planned.

3. *Drainage.*—Drainage of rainwater should be provided. Underground loose-jointed tile may be necessary where water drains against the building on the high side. Gutters and downspouts are also desirable.

4. *Safety.*—Buildings as near fireproof as possible are recommended. Two or more separate exits should be provided. Storage spaces especially for oils and paints should be well ventilated. As mentioned elsewhere, the building should be structurally sound and have all heating, electrical, and power connections properly made.

How to Care for Equipment and Tools

The proper care of shop equipment and tools cannot be over-emphasized. One of the most striking observations made by shop supervisors, is the need



A vocational shop pupil learning to weld in a school shop

for better care of shop facilities. Tools should be kept sharp, perfectly adjusted, protected from rust, in proper place, and should be used correctly. The suggestions given here should provide good tools for use when needed.

Keep Tools Sharp.—The strain on both power and hand tools is reduced to a minimum by keeping them sharp. Also, a great saving in electricity and manpower results from using sharp tools. Pupils should be taught how to sharpen such tools as bits and hatchets that need to be sharpened frequently.

Keep Tools Properly Adjusted.—Not only is the job of keeping tools adjusted a good one for teaching, but a better product is turned out, and the wear on the tools is reduced. Also, improperly adjusted power tools are very dangerous. For safety reasons, if for no other, they should be in perfect adjustment at all times. Directions from the manufacturers should be followed in adjusting tools.

Clean Tools.—Corrosion is one of the greatest enemies of shop tools. It shortens the life of tools and reduces their efficiency. A few simple instructions should be followed to keep tools clean.

1. Polish them frequently with brushes mounted on grinders.
2. Store tools only in a dry place.
3. Clean tools after each use, polish them with a rag that has been dipped in equal parts kerosene or distillate and good new motor oil, and remove excess oil with a clean cloth.
4. Under adverse storage conditions, and when tools are stored for a long time, protect them with a coating of some rust-proof commercial compound, or a mixture of equal parts of white vaseline and new motor oil. After treating the tools, wrap them in heavy paper to protect from dust.
5. If by carelessness tools have become rusty, the rust may be removed by using a rotary wire brush; scrubbing with lump pumice stone and water; rubbing with an oil rag and powdered pumice stone; or using a fine steel wool. After either of the treatments, protect the tools with a coating as described.
6. Clean paint brushes thoroughly after each use, wrap them in wax paper, and store in a flat box or hang by handle so that pressure will not be exerted on the bristles.

Keep Up With the Shop Tools.—It is not difficult to avoid losing shop tools. Tools that are not nailed down should be kept locked in cabinets and/or storage room when not in use. They should be taken out by pupils using them and mounted in the proper place when they are finished with them. Before the class is dismissed, a check should be made to see that all tools are properly stored. The backboard with silhouettes of all tools makes it possible to get a quick accurate check.

Use Tools Properly.—Tools are manufactured to do certain practices. Pupils should be taught the possibilities and limitations of all tools. The tools that fit the job should be used. No improper substitutes should be made because of a rush situation. Directions from the manufacturer should be followed in the use of tools.

Keep Note Book of All Information from Manufacturers.—The manufacturers of shop tools furnish catalogs of all the parts, along with instructions for setting up, adjusting and using the tools. The instructor should keep all of this valuable information systematically arranged in a looseleaf notebook, and filed in a safe place when not in use. This information is very valuable as teaching material for certain farm shop jobs.

PLANNING HEALTH, PHYSICAL EDUCATION, AND RECREATION FACILITIES FOR PUBLIC SCHOOLS AND COLLEGES

By KARL W. BOOKWALTER

Assistant Professor, School of Education, Indiana University, Bloomington; Chairman, Joint Committee for Standards for Physical Education and Athletics, National Collegiate Athletic Association; American Association for Health, Physical Education, and Recreation; and College Physical Education Association

THE five-year building recess we have come through, the renewed faith and interest in the school health and physical education programs, and the obvious trend toward community use of school facilities for recreational purposes have shown an urgent need for standards in facilities for these fields.

At the direction of Dr. Delbert Oberteuffer, president of the College Physical Education Association, a joint committee was formed for the purpose of determining "standards for facilities for physical education and athletics." The National Collegiate Athletic Association subsidized the project to the extent of a $500 grant. The American Association for Health, Physical Education, and Recreation is cooperating through its "Committee for Standards for Facilities," headed by W. K. Streit, chairman. The Research Committee of the National Section on Women's Athletics is also cooperating through its chairman, Dr. Carolyn W. Bookwalter. A grant of $65 was obtained from this source. The College Physical Education Association is cooperating through the author, chairman of the joint committee, and through publication of the final study upon its completion.

It is hoped that within a year scientific standards will be available for the guidance of the many school systems which will be adding to their health and physical education facilities.

Research Workers

A meticulous survey of existing literature (subsequent to 1920) is being made by the following master's and doctoral candidates and research workers.

Elementary School Level
Carolyn W. Bookwalter, chairman, Research Committee, N.S.W.A. Karl W. Bookwalter, chairman, Joint Committee

Junior High School Level
Paris J. Van Horn—doctoral candidate

Senior High School Level
Doris Boettjer—doctoral candidate
Virgil Schooler—doctoral candidate

College Level (Men)
C. Wesley Dane—doctoral candidate

Health Education in Public Schools
Julia Betty Morton—master's candidate

AUTHOR'S NOTE: This article is not necessarily in accord with the opinions of all or any of the cooperating personnel. The author assumes sole and personal responsibility for the contents herein.

As can be seen, there is still need for a doctoral study on the college level for women. It is hoped that such a worker will be located at an early date.

The research workers receive guidance on the preliminary check-list and on the final publication in matters of policy, procedure, and sources from the combined memberships of the participating committees. There are nearly thirty of these nationally prominent and expert advisers.

Research Procedure

It is proposed to send the check-list to approximately fifty members of the Society of State Directors of Health and Physical Education, sixty members of the College Physical Education Association, and thirty members of the Society of City Directors of Physical Education, and such other experts as the advisory committee may suggest. The returns from this jury will be punched on Hollerith cards and minimal, medium, and optimal standards will be determined for elementary, junior high school, senior high school, and college facilities for both sexes. The Hollerith technique will permit a further analysis for bias or preference according to sex, level of work, geographical location, and size of city or town of the person responding.

In setting up the check-list, there will be an intentional bias or direction, of the responses of those cooperating, effected by *frequency* of quotation of standards in the literature, *recency* of quotations, and *authenticity* of sources. To obtain this bias, all standards will be followed immediately by their bibliographical index numbers. A complete bibliographical list will accompany the check-list. It is felt that variation in standards will be less, and validity of response will be greater, through this procedure than would be the case if the cooperating jury were asked to give their unguided opinions.

Planning Facilities—Principles

As important as it is to determine standards for facilities, mere standards of number, size, and quality are insufficient guides in the planning, use, and maintenance of the functional school plant. The following principles, therefore, are proposed by the author for use in determining the facilities essential to attainment of the objectives: physical fitness, sports skills, sports understandings, recreational capacity, and safety capacity. The principles are taken up in alpha-

betical order since their importance would vary with situations and circumstances. They are interacting and interdependent. Neglect or excess in one principle will detract from the advantages normally accruing from adhering to the other principles.

Accessibility

Facilities should be conveniently located. Elementary school grounds should be within a half-mile radius of all children who are expected to use the play areas, and junior high schools should be within a three-quarter mile radius. A radius of a mile or more is not too great for high school groups.

The school building must be contiguous to the playgrounds and athletic fields. It is imperative that indoor instructional and service areas for health and physical education be immediately accessible to the outdoor areas. To meet this obvious requirement, the indoor facilities should be on the ground floor. The waste in class time and efficiency caused by placing these areas apart is tremendous.

Within the building the instructional, service, and administrative areas must be close together if time and energy are to be conserved. Frequently used units, such as the gymnasium and locker rooms, must be reached easily by pupils or community patrons. Less frequently used areas need not be so centrally located. All units serving a common functional purpose—as lockers, showers, toilets, or health office-rest-room-examination room—must be functionally related, with entrances from one unit into another.

Beauty

Facilities should be attractive and should inspire appreciative treatment. Playgrounds and play fields should be "attractive neighbors." Beauty is enhanced by good housekeeping. Grounds should be nicely landscaped, with vines and shrubs at sturdy well-kept fences. Grass borders and open areas should be well kept. Not only are play fields free from rubbish and litter more attractive, but they are also more safe and hygienic. Wherever possible, school sites should adjoin city parks.

Toilets, locker rooms, and shower rooms should be light and well ventilated and should have colorful nonpermeable flooring and walls. This will encourage easy care and cleansing and thus aid in the prevention of unwholesome odors and infections. Ease of maintenance, attractive and harmonious color schemes, and adequate light and ventilation make the facilities more inviting and more conducive to mental and physical hygiene.

Departmentalization

Related areas and groups should be in a functionally related unit or department. Athletic fields should be close to their respective service and instructional units. Since boys' and girls' departments are mutually related and frequently must jointly use certain areas or units, the two departments should be closely related in the same wing or end. The health facilities must provide for smooth flow of examinees through the units of the department.

Economy

Expenditures of money, time, and energy for the construction, use, and maintenance of health and physical education plant should be kept as low as is compatible with effective instruction and with maximum wholesome participation.

Improperly surfaced small play areas are hazardous and may prove extremely costly. Areas inadequate for the activities for which they are intended are wasteful and frequently worthless for their purpose.

When classes must go a long distance to a play area the educational efficiency of that space is immediately cut twenty to fifty per cent. As this waste goes on for the life of the plant, such a policy is obviously unwise.

Space may frequently be purchased ahead of immediate needs at an ultimate saving. It might be better to evaluate and purchase undeveloped land at a reasonable cost when the opportunity presents itself than to wait until areas are improved and prices are prohibitive.

It is false economy to disrupt a going program by usurping needed play space for expanding building needs, as is too frequently done. Future population trends can be anticipated by consulting gas, power light, telephone companies, and realtors (or better, county abstract officers) to determine areas of likely development. Interest costs on the purchase price of unimproved land are balanced by the enhanced value of the developed land.

Money spent on property drainage, surfacing, and construction at the beginning pays dividends in increased utility, attractiveness, safety, and sanitation. Second-thought alternatives are always costly. Durable materials may cost more initially than temporary materials, but their longer life makes their use the best long-term policy. Rising costs alone make good construction a necessity, but beauty, safety, and sanitation are usually gained as well. Multiple use, within practicable limits, contributes to economy.

Flexibility

Increase or change in the activities offered should be readily and economically possible. If, for example, a pool is not immediately feasible, its installation at a future date may be anticipated by allowing adequate space and an appropriate location for it in the initial plans. Increase in community use of the school must be expected; therefore, plans should provide flexibility to assure adequate accommodations in the future. If the school is being built for a new and growing community or district, corridors, partitions, foundations, plumbing-heating-lighting installations, and total building design must be planned with expected future developments taken into consideration. Facilities built on the unit plan tend to facilitate long-range planning.

Isolation

The elimination of odors, noises, and moisture; the segregation of activity groups; and the exclusion of undesirable persons should be automatic and effective.

Toilets, locker rooms, and storerooms even when well ventilated can create undesirable odors which should not permeate the school plant. Proper setting off of such facilities in one wing or end of the building aids in this matter.

Locating girls' play areas close by the girls' department and the boys' play areas close by the boys' de-

partment, and setting aside definite areas for special age groups, promotes more effective instruction, greater safety, and facilitates supervision. Attractive, sturdy, and sufficiently high fencing of all play fields keeps intruders out, equipment in, and prevents youngsters from dashing into adjacent highways to retrieve balls. When recreational, instructional and service units are properly departmentalized, participants may be isolated from the rest of the school plant by providing strategically located folding gates across the hallways. These gates should reach from floor to ceiling and when folded should recess into the walls.

Unit installation of light, heat, and ventilation reduces the maintenance and supervision costs for out-of-school and non-school participation.

Safety, Hygiene, and Sanitation

Consideration must be given to safety, hygiene, and sanitation in the provision, arrangement, and maintenance of facilities. Fencing of all playgrounds, previously mentioned, is a necessity for all levels for the safety of participants. Windows on the sides of building adjacent to play areas should be sturdily screened with hinged screens that permit the washing of windows.

The grounds should be graded and free from obstructions. Crushed rock, cinders, and rubbish are unsatisfactory surfaces from the standpoint of safety, infections, and abrasive action on clothing. Either turf or sandy loam is the best surface for major sports generally. Grounds should be drained by slope and tiling to permit their ready use at all times.

It should not be necessary to cross thoroughfares and busy highways to get from homes to school, or, especially, from school building to playgrounds. Where such locations are unavoidable, underpasses should be planned at strategic points. Dangers from gas plants or other polluting or contaminating industrial sources should be avoided. Dust should be allayed by calcium chloride or by sprinkling, or should be avoided by sodding or mixing sand with loam.

The gymnasium and other play areas must be large enough to accommodate peak loads, for congested areas are dangerous. Walls should be free from projections for a height of at least eight to ten feet, and all appurtenances to floor equipment should be properly countersunk.

Floors of toilet, locker, and shower rooms should be drained. Impermeable materials that will permit flushing with a hose should be used.

Sufficient natural and artificial light should be provided to keep down infections and accidents. About ten-foot candles is adequate for general use. Heat should be held at approximately 60°-65° in the gymnasium, 70°-75° for a locker room and shower room, and 65°-70° in a classroom. (Probably 68° is about right with humidity at 40 to 60 per cent.) Forced cross ventilation is recommended. Glare from blackboards, windows, or light fixtures must be avoided.

Soundproofing pools, gymnasiums, and classrooms and isolating play areas from academic instructional areas will lessen mental strain. Play areas should be separated from music, shop, and other noise-producing areas.

Spectators should be kept from the pool deck and gymnasium floor. Neither should they use the toilet facilities intended for activity classes. Segregated play areas should be set aside for different age groups.

Location of apparatus must be planned so that their use will not imperil, or be imperiled by, other activities.

Constant supervision of pools, gymnasiums, and playgrounds while they are in use is essential.

Exits should be adequate to empty the building in three minutes. Stairways should not lead straight out to the playground or down to the gymnasium. At least one-quarter turn should have to be made.

Supervision

The oversight, control, and management of activities and groups will be facilitated by visibility. Supervision is an educational necessity, a moral responsibility, and a legal obligation. Floodlighting of playgrounds during night use, fencing out intruders, and centralization of administrative space will promote adequate supervision of playgrounds and gymnasiums.

The director's office should be centrally located with regard to playground, gymnasium, showers, locker, and storerooms. The pool room must have an office overlooking the entire pool area, and a guard must be present during all use of the pool. Visibility of all areas and proper segregation of groups are necessary to effective supervision. Good supervision increases safety and reduces property loss.

Control and inspection of apparatus must be possible at all times. Separate areas for different age groups and sexes are easier to control. Isolation of unused areas of the building by gates reduces the area which must be policed or overseen. The fewer the entrances, the easier the supervision as a general rule.

Master keys for each major department renders these areas more accessible, but such keys should be available only to responsible staff members.

Utility

Adaptability of areas to multiple use enhances their utility. Scheduled use makes for greater effectiveness of areas. The community should have access to all activity areas when school use does not take precedence. Boys and girls must have equitable allotments of space. Above all, an area must be large enough and suitably equipped for its intended function.

Proper planning of the program to permit rotation of activities is desirable, but there is an irreducible minimum of area essential for any well-conducted and adequate program. There should be no unused spaces.

Evening use, by adults, of children's play areas is generally possible, but seldom do courts of regulation size suit children's needs nor is the reverse true. For full utility, consideration must be given to the regular program, intramurals, inter-scholastic contests, and community needs.

Economical use of the school plant demands summer use of health and physical education facilities.

Validity

Facilities must be in accord with curricular needs, scientific facts, legal requirements, and inter-scholastic sports rules.

Facilities must be planned in terms of administra-

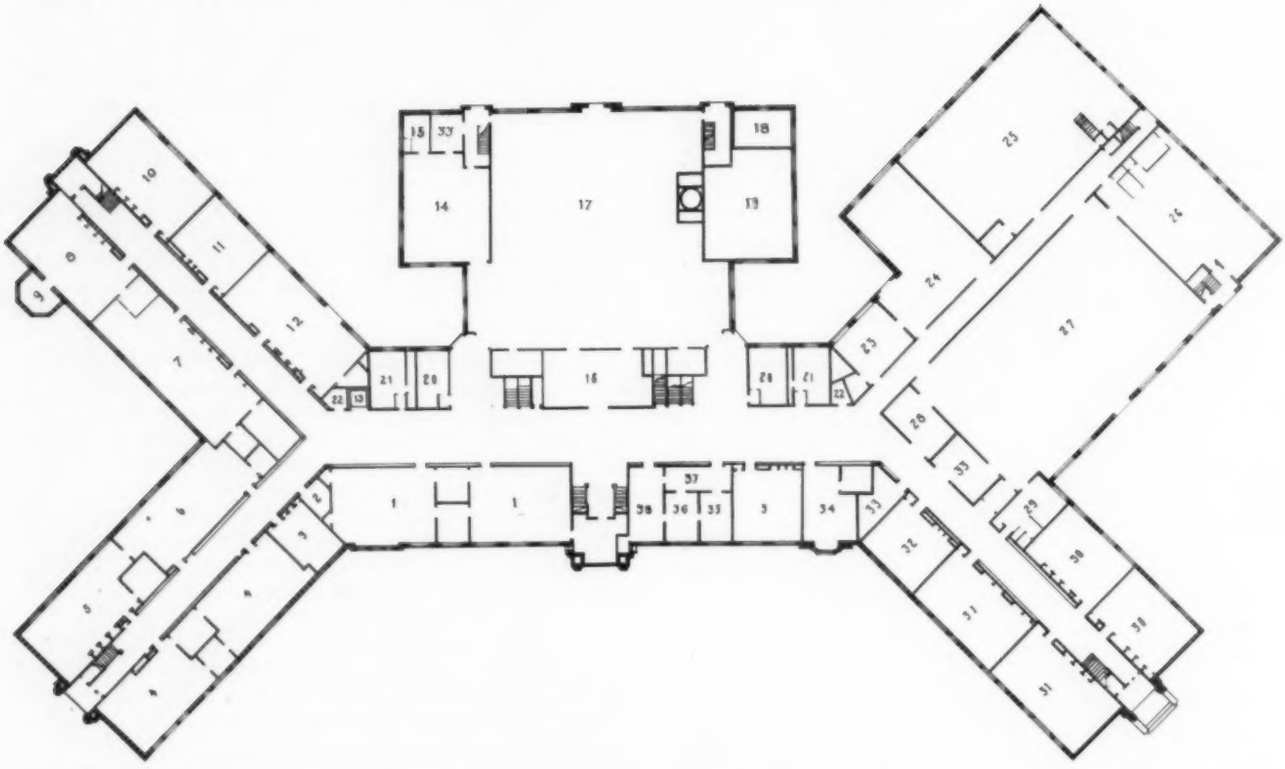


Figure 1. First floor plan of West High School, Denver, Colorado. W. H. Edwards, architect

Legend:

1 Cooking laboratory
2 W. t.
3 Classroom
4 Clothing laboratory
5 Sheet metal shop
6 Machine shop
7 Woodwork shop
8 Biology laboratory
9 Conservatory
10 Electrical shop
11 Lecture room
12 Auto shop
13 Elevator
14 Kitchen
15 Dressing room
16 Faculty lunchroom
17 Lunchroom
18 Upper part coal room
19 Upper part boiler room
20 Girls' toilet
21 Boys' toilet
22 J
23 Student publications
24 Printing
25 Girls' gymnasium lockers
26 Boys' gymnasium lockers
27 Boys' gymnasium
28 Cadets
29 P. d.
30 Typing
31 Bookkeeping
32 Appliances
33 Store
34 Men's restroom
35 Boys' exam.
36 Girls' exam.
37 Clinic
38 Girls' restroom

tive, instructional, recreational, and service areas since the full use of each is dependent upon the adequacy of the others.

Competent cooperative planning by architect, administrator, directors of the programs, and the custodial force is necessary to assure a functional layout and economical maintenance.

Every plant should be planned with consideration of community customs, traditions, and present and future needs. Boys' and girls' programs must each be given consideration. It has been said that we can have anything we want if we want it badly enough. Program, therefore, should determine facilities; not facilities, the program. This necessitates consideration of the regulations and rules governing sports and of the best existing knowledge of child growth and developmental needs. Bare minima are undesirable standards which do not serve two-thirds or more of our schools.

Examples of the Principles Applied

West High School, Denver, Colorado

In the first floor plan (Figure 1) of West High School in Denver, Colorado, you can see the application of many principles. In the first place, the double "Y" shape of the building makes for maximum *accessibility* to all parts of the building. Furthermore, the *orientation* is such that the maximum of natural light is available most of the day (the long axis of the building runs north and south, and the entrance faces the east). The building faces lovely sunken gardens, the setting for noon strolls and ice skating.

As to the physical education departments proper, the play fields are contiguous to the first floor boys' gymnasium and the locker *rooms* for both boys and girls. Both departments are in the same wing, another example of *accessibility* and *departmentalization*. On the other hand, a secondary hall isolates the boys' and girls' departments. The proximity of the boys' locker room to the girls' locker room is not desirable, however.

While the office of the director of boys has full view of the gymnasium, the service facilities proved to be inconveniently separated from the office. The same holds true for the office for the director of girls. *Supervision* of the second floor girls' gymnasium is convenient, but the locker room is inconveniently located under the gymnasium, with egress to the locker room from the gymnasium at the end farthest from the director's office.

The *isolation* of the physical education facilities indoor and outdoor (play grounds are to the north

and west of the wing) from the rest of the school academic plant is highly desirable, and, on the whole, the plant is generally an efficient and pleasant one in which to work.

The building was finished in 1925.

Lake Junior High School, Denver, Colorado

The first floor plan (Figure 2), of Lake Junior High School, built about 1926, is exhibited as an extremely efficient, convenient, and adequate school plant in which *beauty* was obtained along with reasonable economy.

The long axis of the layout runs east and west, and the building overlooks a lovely municipal lake, the curved shore of which fits harmoniously into the landscaping of the approach to the front of the building. Looking across the lake from the building to the west, the snow-capped peaks of the Rockies adds to the beauty of the park, the lake, and the building itself.

Both the high school and junior high school are examples of the Denver policy of locating school facilities adjacent to municipal recreational areas wherever feasible.

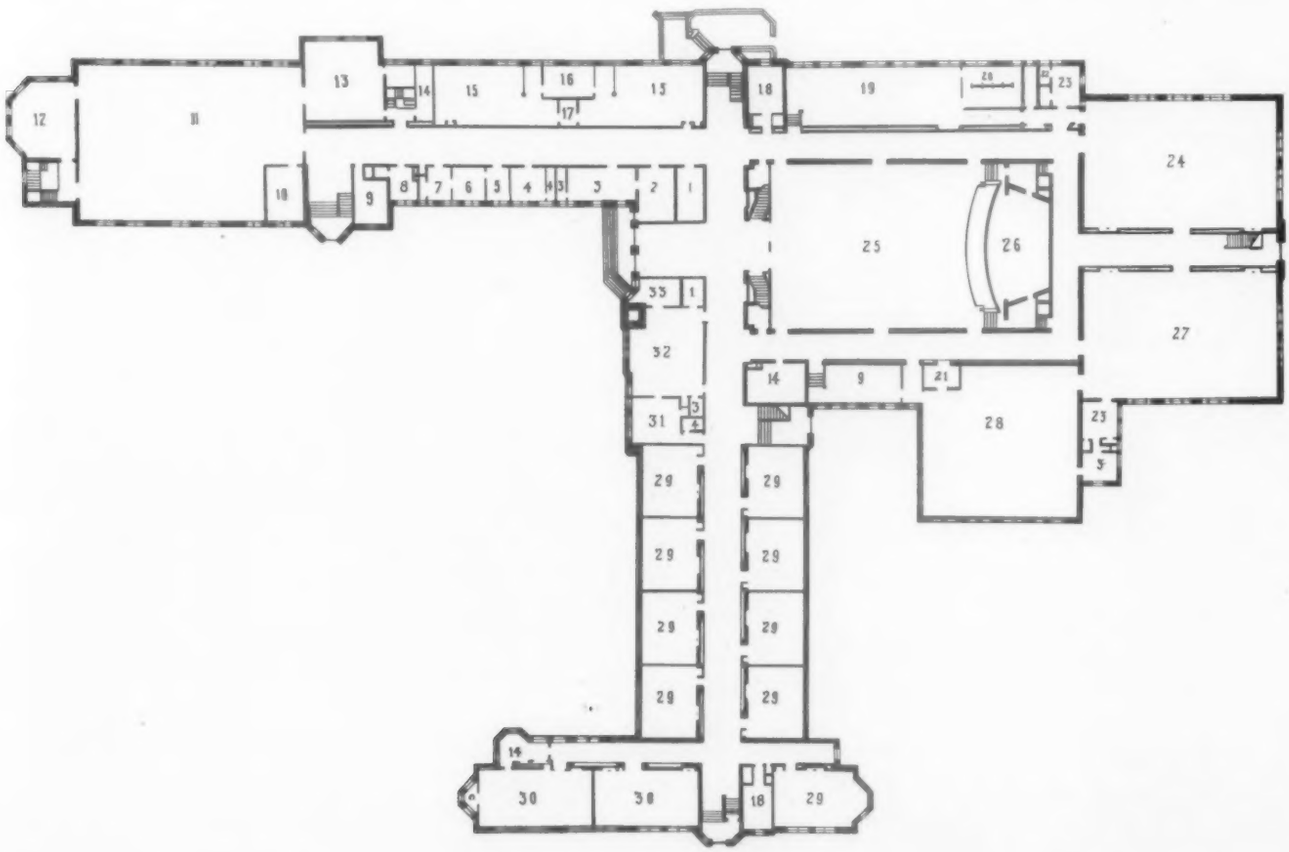
Again referring to the physical education plant, the obvious *isolation* of the more noisy play areas from the rest of the school is nicely accomplished. (The playgrounds are located to the rear and east of the school building.) The *departmentalization* of the boys' and girls' facilities is rather complete and on one floor.

The *accessibility* of the playgrounds to the gymnasiums is assured by the secondary hallway common to both. *Supervision* of both gymnasiums is facilitated by windows from both directors' offices overlooking the floors. The inconvenient location of the offices with regard to service facilities is eliminated as both directors' offices are adjacent to locker and shower facilities. Note how conveniently the towel rooms are located with regard to the exits from both locker rooms.

In case of pageants, demonstrations, and graduations the back entrances to the stage and auditorium are conveniently located close to the two gymnasiums. It might be noted further that the office of the dean of girls, the girls' restroom, and the health offices are conveniently located at the west end of the long hall common also to the physical education facilities. This

Figure 2. First floor plan of Lake Jr. High School, Denver, Colorado. Hoyt & Hoyt, architects

Legend:
1 Store
2 Dean of girls
3 Girls' restroom
4 Men's restroom
5 W. r.
6 Clinic
7 Restroom
8 Office
9 Girls' toilet
10 Dishwashing room
11 Cafeteria
12 Faculty lunchroom
13 Kitchen
14 Storage
15 Food laboratory
16 Dining room
17 Store
18 Boys' toilet
19 Boys' locker room
20 Shower room
21 Towels
22 Toilet and shower
23 P. d.
24 Boys' gymnasium
25 Auditorium
26 Stage
27 Girls' gymnasium
28 Girls' locker room
29 Classrooms
30 General science
31 Principal
32 General offices
33 Assistant principal



Views of a modern gymnasium in a midwestern laboratory school



East side of the gymnasium. The space under the gallery is utilized as a playroom and for other instructional purposes. The gymnasium is visible through screened windows. In the gallery, glass brick provides needed light in second floor equipment storerooms. Cross courts are available for class use. When games are played on the long court, the backboards for the cross courts swing up to the ceiling, thus giving spectators a full view. Egress is possible from two sides of this room. Note also the sanitary drinking fountain and cuspidor



Southwest corner of the gymnasium. Note view from director's office, permitting supervision of activities. Location of fixed apparatus at this end permits the use of the other end for games. Adequate wall space is provided for target throws and testing activities. The gymnasium is well lighted and ventilated although the afternoon sun is a source of annoyance

building is one of the most efficiently planned buildings with which the author has ever been connected.

It might be interesting to know that one reason the foregoing building plans were chosen for this article was that the Denver schools actually planned their schools at that time with most of these principles as guides. The reflection of the principles in the actual buildings speaks well for the utility of such principles.

Laboratory School in the Midwest

Several good features and several poor features can be seen from the views of a recently constructed gymnasium in a laboratory school in the Midwest.

An electric clock and bell are observable just over the entrance to a spacious apparatus storeroom which can be seen through the open sliding door. This door is wide enough to permit parallel bars, mat dolly, and other large equipment to be removed quickly from the floor. The seating accommodations in the gallery are adequate for only about half of the spectators. Unfortunately, space was not allowed on the 60 by 90 feet floor for folding bleachers for the other half of the spectators. Accordingly, conditions at interscholastic basketball contests are crowded. Another 15 feet in width would have permitted adequate provision to be made for the spectators.

The ceiling is fireproofed but unusually poor acoustically. The incessant reverberation could be stopped yet, by stretching a wire mesh screen just below and between the girders and affixing some acoustical material to it.

This gymnasium, the only one for more than seven hundred pupils, is far from adequate for the load.

If the new gymnasium being planned is built, better seating accommodations can be included, and the congestion on the floor will be eliminated. It is quite likely that the excessive sunlight will be materially reduced as well. In the meantime, drapes can be drawn over the windows with effective results. In the new gymnasium, acoustical treatment should be applied to both areas.

In spite of these faults this plant is clean, wholesome, and in many respects conveniently arranged. Cooperative planning accounts for many of the good features, and a too rigid economy accounts for most of the poor ones.

SELECTED AND CLASSIFIED REFERENCES ON FACILITIES IN HEALTH AND PHYSICAL EDUCATION

Athletic Plant

LAMAR, EMIL. *The Athletic Plant,* (Layout, Equipment and Care). New York: Whittlesey House-McGraw Hill Book Co., 1938.
Detailed specifications for areas and equipment.

LOWE AND CAMPBELL, *Field and Court Dimensions.* Kansas City: 1944.

College

EVENDEN, E. S., STRAYER, G. D. AND ENGELHARDT, N. L. *Standards for College Buildings.* New York: Teachers College Press, 1938.
General in facilities. Specific for level.

HOUSTON, RUTH ELLIOT. *Modern Trends in Physical Education Facilities for College Women.* New York: A. S. Barnes & Co., 1939.
Suggestive plans and photographs.

HUGHES, WILLIAM L. *Administration of Health and Physical Education in Colleges.* New York: A. S. Barnes and Co., 1938.
Thorough and complete for the college level.

See LEE (below).

General References

BLAIR, HERBERT. *Physical Education Facilities for the Modern Junior and Senior High School.* New York, A. S. Barnes and Co., 1938.
Definite specifications for planning indoor facilities. A very good source.

California State Department of Education, Division of Health and Physical Education. *A Score Card for Evaluating Physical Education Programs for High School Boys,* Sacramento, *Bulletin No. E-2,* 1931.
Outstanding reference for specific standards.

———. *A Score Card for Evaluating Programs for High School Girls,* Sacramento: *Bulletin No. E-3,* 1931.
Outstanding reference for specific standards.

ENGELHARDT, N. L. *Standards for Junior High School Buildings.* New York: Bureau of Publications, Teachers College, Columbia University, 1932.
General in facilities. Specific for level.

LAPORTE, WILLIAM RALPH. *The Physical Education Curriculum.* Los Angeles: University of Southern California Press, 1942.
Public school provisions. Score card included.

LEE, MABEL. *The Conduct of Physical Education.* New York: A. S. Barnes & Co., 1937.
Emphasis upon women's needs.

NASH, JAY B. *The Administration of Physical Education.* New York: A. S. Barnes & Co., 1930.
One of the best public school references for provisions for both sexes.

STRAYER, G. D. AND ENGELHARDT, N. L. *Standards for Elementary School Buildings.* New York: Bureau of Publications, Teachers College, Columbia University, 1923.
General in facilities. Specific for level.

———. *Standards for High School Buildings.* New York: Bureau of Publications, Teachers College, Columbia University, 1924.
General in facilities. Specific for level.

———. *Standards for Village and Rural School Buildings of Four Teachers or Less.* New York: Bureau of Publications, Teachers College, Columbia University.
General in facilities. Specific for level.

WILLIAMS, J. F. AND BROWNELL, C. L. *Administration of Health and Physical Education.* Philadelphia: W. B. Saunders & Co., 1939.
Very good for the total program in public schools. Many specifications.

Locker and Shower Rooms

BARTHOLOMEW, CLARENCE. "Standards for Locker and Shower Rooms." *Journal of Health and Physical Education,* January, 1941. Vol. XII, No. 1, p. 29-31, 57, 59.
Rather complete, specific, concise, empirical standards.

Playground and Recreation Areas

BUTLER, GEORGE D. The National Recreation Association, *The New Play Areas.* New York: A. S. Barnes & Co., 1938.
Best of its kind, chiefly on recreational areas.

Safety

National Safety Council, Safety Education Series. *Safety in Physical Education and Recreation for Elementary and Secondary Schools.* Chicago: 1941.
Concise and helpful.

Surfaces

National Association of Public School Business Officials, "Playground Surfacing," *Bulletin No. 7,* John T. Catechm. Pittsburgh: 1940.
Splendid source on this topic.

Swimming Pools

LEUHRING, F. W. *Swimming Pool Standards.* New York: A. S. Barnes & Co., 1939.
Complete and authoritative on all school levels.

See HUGHES (above).

See WILLIAMS AND BROWNELL (above).

EQUIPPING THE MUSIC DEPARTMENT



Instrument rehearsal room, Senior High School, West Lafayette, Indiana

By CLARENCE J. BEST

Director of Music Education, School District of Maplewood and Richmond Heights
Saint Louis County, Missouri

THE planning of the physical plant for school music has been a perplexing problem for the school administrator, the school architect, and quite often for the teacher or supervisor of music. The rooms for housing music and the type of equipment found in music rooms reflect the early objectives of music education. With the gradual elevation of music to a regular place in the curriculum, interest has grown in adequate housing and equipment for the program.

Isolating the Music Department

The separate music building is the ideal arrangement for music education. If a separate building is not possible, it is best to plan for isolation of music rooms in a separate wing of the main building. Also, the music department should be located near the auditorium stage and on the same level, so as to facilitate moving of instruments for programs.

Good Acoustics

Acoustics presents a special problem in music rooms. Echoes, sound foci, dead spots, and excessive reverberation should be eliminated from music rooms. Sound transmission to other parts of the school building is a problem also. Unnecessary transmission of sound through walls, floors, ceilings, windows and doors, and air and heating ducts interferes with class work in other departments. Acoustical correction is possible with existing buildings, but is more easily accomplished by careful planning in new construction.

Adequate Lighting

Since musical organizations, especially instrumental groups, employ an irregular, semi-circular arrangement of seating, it is imperative that all parts of music rooms be lighted adequately. Unilateral natural lighting has been given official recognition by school building authorities as being better than bilateral lighting since the latter causes bad cross shadows. In any case, artificial lighting should be used to augment natural lighting, and an automatic photo-electric cell provides the most efficient method of lighting control.

Heating and Ventilation

While heating and ventilating are major building problems, considered for the school as a whole, it is particularly important that music room temperatures be regulated carefully. Students singing or practicing on musical instruments need large quantities of fresh air. Overheating or underheating are, of course, bad for the health of students; in music rooms, instru-

EDITOR'S NOTE: See "Building Facilities for Music Education," by Mr. Best, *The School Executive*, March, 1946, pp. 57 ff.

ments also suffer. Changes in temperature have an unfavorable effect on instrument tone, causing changes in pitch, changes which are not in proportionate ratio for the different instruments.

Walls, Floors, Windows

Except for special acoustical treatment, doors and windows, walls and ceilings and floors all come in for much the same consideration in music rooms as in other departments.

Built-in Fixtures and Furniture

It is the equipment within a building that finally makes that building usable and workable as a school. Aside from musical instruments, there is need for a great deal of equipment in a music department. Furniture and built-in fixtures should be designed for particular functions. Cumbersome pieces that absorb space and clutter the room should be eliminated. School music departments can be much improved by careful attention to special music needs and problems.

Large Vocal and Instrumental Rooms

The equipment in the instrumental rehearsal room is most expensive of all music equipment. Good quality is essential because of intensive wear and tear.

Chairs

No chair has yet been devised to secure a correct sitting position for instrumental music students. The best approximation is the straight bentwood chair. It is advisable to pay a little more in order to secure the best grade chairs because screws pull out of the cheaper models and because the wood in the cheaper chairs often warps. Chairs constructed of hard, seasoned wood are probably the most durable.

Folding chairs of the common variety are not suited for instrumental music performance because they do not induce an erect sitting posture. Chair manufacturers would do school music as well as other school departments a great favor if they were to develop a folding chair that would help students to sit erectly. Such a chair would need to have a narrow, almost perpendicular back which would support the performer's back slightly below the shoulder blades, thereby allowing freedom of the lower rib muscles. If this type of chair were well constructed, not too expensive, and designed to allow easy stacking, it would have a ready market.

If the instrumental room is also used for choral classes, it would be well to have chairs with adjustable tablet arms that fold under when the instrumentalists use them. However, the bentwood chair would be fairly satisfactory for both vocal and instrumental music. If theory of music is taught in the instrumental music room, tablet arm chairs are necessary.

If chairs need to be moved from one room to another, folding chairs are essential. In this case, it would be wise to secure regular chair trucks or "dollies." These may be purchased from chair dealers, or they may be constructed in the school industrial arts or carpentry department.

Music Stands

A durable metal stand that is adjustable as to height and angle of desk is preferable. Many schools use music stands made in their industrial arts departments. These stands, usually made of wood, are not adjustable and in most cases are not suitable for efficient school use. The professional theater stand which has an unbreakable cast-iron base is ideal for school use. The desk part may be sheet metal or wood.

The ordinary collapsible music stand is not recommended for the rehearsal room because it does not hold folders of music safely and is easily overturned. Such a stand is practical for individual home practice and for occasions when the band or orchestra plays away from its own quarters, at outdoor performances such as football games or May fêtes. These stands do, however, have one advantage in the school rehearsal room—when not in use they can be lined against the wall without consuming too much floor space. Generally speaking, the heavier type is more suitable for all-around use in instrumental rehearsal rooms.

Director's Stand and Podium

The director's stand should be similar to the other stands recommended for the rehearsal room, but it should be heavier and should be equipped with a music shelf just below the music desk.

The director's podium is necessary for all instrumental rehearsal rooms in order to make the director easily visible to all performers. This is especially true for larger ensembles and for rehearsal rooms without risers. It is possible to purchase a collapsible model made of plywood.

It is not a great task to make a podium in the industrial arts shop of a school. It should be about 30 inches square and from 7 to 9 inches high. Oak is the most durable material because it does not warp readily. Metal gliders placed on the bottom corners make it more solid. Also, if the top is covered with rubber sheeting, it is not so tiring for the director who must stand on it for long periods of the day.

Risers

When the levels of instrumental performers gradually rise above that of the conductor, the players more easily maintain correct positions for playing their instruments. They do not obstruct one another's views and they can hear the instruments of the other performers much better. Portable folding risers can be purchased in various dimensions to fit rehearsal rooms.

Instrument Racks

Whenever possible, instrument lockers, cabinets, and shelves should be located in a separate room. Since musical instruments are delicately made and easily damaged, they should not be strewn around the floor of the rehearsal room. Shelves, lockers, and cabinets may be built around the sides and back of the rehearsal room. Space at the front of the room should be used for chalkboard, bulletin board, and charts that aid in the instruction of music.

If instruments must be stored in the rehearsal room, a plan that does not use too much floor or wall space is that of individual shelved compartments for various instruments. Shelves should be 14 inches deep from front to back with individual compartments from 8 to 10 inches high. Shelving should start above the mopboard and provide storage to a height of 5 or 6 feet. Partitions should be placed so as to make spaces ap-



Roll-Away Violoncello Rack

The Roll-Away racks are recommended for the storage and protection of violoncellos, brass viols, and sousaphones. Although patented, they may be purchased from their inventor, Wayne F. Sherrard, Illinois State Normal University, Normal, Illinois, at reasonable cost

proximately 18 inches long for the smaller instruments and 26 inches long for the longer instruments.

Cabinets should be provided at floor level for larger instruments such as the xylophone. These cabinets should be large enough so that instruments can be rolled easily into their spaces. For bass viols, racks on rollers should be used.

Instruments may be stored also by hanging them on pegs fastened to a wall which is cushioned with pads. This plan is less desirable because of unsightly appearance and because there is danger that instruments may be knocked off pegs.

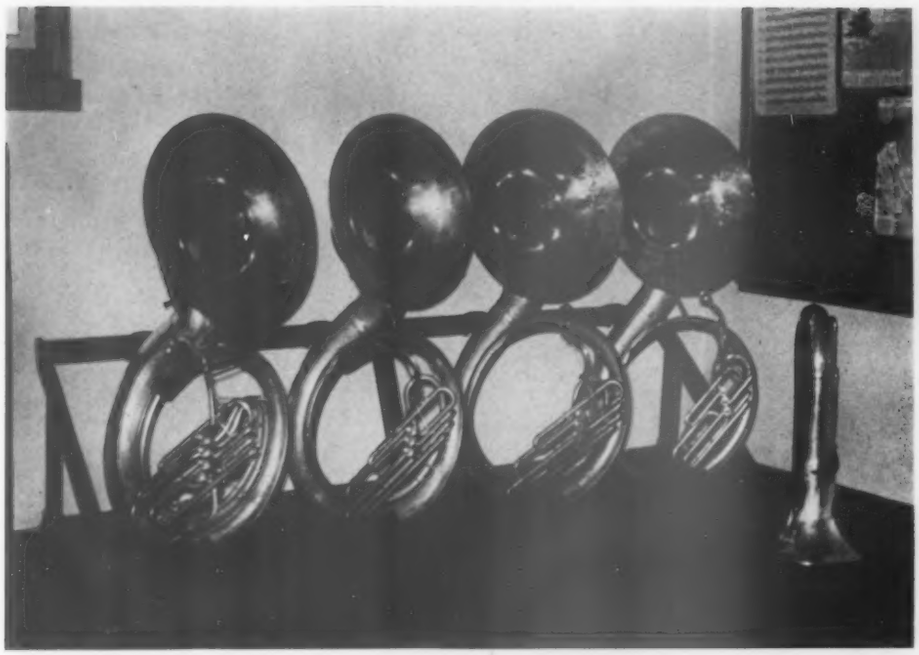
Percussion Cabinet

It is wise to have all small percussion equipment in one place for safe storage as well as for accessibility. A percussion cabinet should be equipped with rubber casters so that it can be moved easily to the part of



Percussion Cabinet

One shelf should be long enough to hold a set of orchestra bells. Two to four drawers should be provided for storing small equipment such as maracas, wire brushes for snare drum, drum sticks, wood blocks, bird whistles, mallets, and other small equipment. The cabinet should be equipped with two drawers that can be locked securely



Roll-Away Sousaphone Rack

The racks are furnished with rubber casters, padded with a serviceable material to prevent marring of instruments, and are constructed of furniture oak finished well enough to fit into any type of room

the rehearsal room where the percussion section is assembled. The shelves should be designed to hold various sizes of instruments—cymbals, tambourines, and so on.

Music Folder Cabinet

A good storage cabinet for rehearsal folders is a great convenience and time saver. In order to facilitate prompt starting of band and orchestra rehearsals, the folders of music should be accessible to students as they enter the rehearsal room. The storage cabinet should be constructed for quick visibility and easy handling of folders.

Pianos

Upright pianos may be used in music rooms, but for most musical activities a small grand is preferred. Pianos should be mounted on large rubber casters,



Filing Cabinet

A music department library should be supplied with filing cabinets for vertical filing of music and phonograph records. Shown here are legal and letter size filing cabinets arranged as a unit. Shelving overhead, in addition to obvious use for storage, makes possible complete anchorage of files, removing the danger of their tipping over



Horizontal filing in steel storage cabinets. Uniform folders for each type of music—band, orchestra, and chorus—are used

ballbearing mounted, or in metal frames equipped with this type roller caster. Such equipment facilitates movement and pays dividends in helping to keep the piano in tune and in preventing damage to the piano legs and to floors.

Tuning Bars

A well-furnished instrumental music room should have two tuning bars, one for orchestra with a pitch of A-440, and one for band, with a pitch of B flat-446.2. The bars should be provided with resonating boxes so that the tuning pitch may be heard in all parts of the rehearsal room.

Vocal Rehearsal Room

Some of the items of equipment in the vocal music rehearsal room are the same as those for the instrumental room.

Chairs

A straight chair with a tablet or desk arm and receptacle for extra books or music is preferable for choruses.

Some schools in which permanent risers are built in as part of the floor are also equipped with theater or opera chairs permanently screwed to the floor. These chairs can be obtained with or without the arm tablets.

Risers

The advantages of risers for choruses are similar to those for instrumental music, but it is not necessary to have such great distance between rows for chorus risers as for instrumental music risers since less space is required for choral music performers.

These risers may be of the permanent or of the portable, collapsible type. The portable type has the advantage of being easily transported to the school stage or to other places for special programs. How-



Piano used in West Lafayette Senior High School music hall

ever, since the portable type is so expensive and since there is a great advantage in having the chairs secured to the floor with screws, the permanent kind is better.

Every chorus should have a set of portable, collapsible risers designed for the standing chorus. These risers not only make groups sound better in public performance, but they improve their appearance.

Music Department Office Equipment

Standard office equipment should be supplied to the music department office. The most important items of equipment are desk and chair, typewriter, filing cabinets, small card indexes for records, book cases, storage cabinets, clock, and telephone. Some desirable items are piano, chromatic stroboscope, recording machine, radio-phonograph, duplicator, and similar equipment which will help the department in doing its work without bothering the general office.

Equipment in Practice Rooms

There is little need for much equipment in small practice rooms. The only necessary equipment for individual practice is a chair and music rack. Certainly the room should not be cluttered with unnecessary furnishings. Some of the rooms should have a piano, but not all of them. The larger practice rooms should have enough chairs and music stands for the number of students who use them for sectional rehearsals.

Equipment in Storage Rooms

Each member of the band or orchestra should have a steel or wooden locker to fit his particular instrument. The ideas suggested earlier for storing instruments in the instrumental rehearsal room could well be incorporated in an instrumental storage room.

A special wardrobe case, preferably within the main storage room, should be provided for the storage of choir robes and band uniforms. While it is impor-



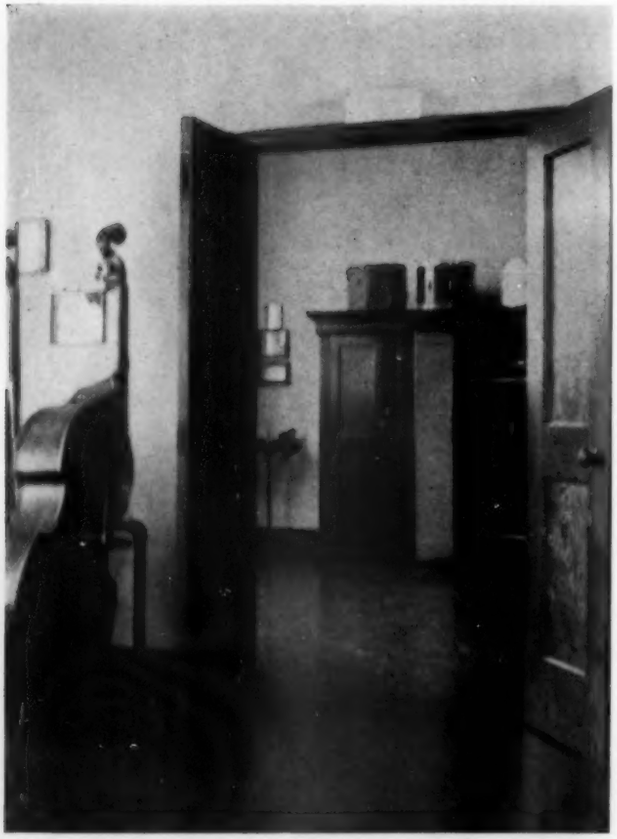
Band members of the Arthur Hill High School, Saginaw, Michigan, leave uniforms for storage at exit passage from the band room



Inner instrument storage room of the Arthur Hill High School band room. Attendants handle instruments over drop counter between the band and storage rooms



Instrument storage, band room side, Arthur Hill High School. The shut doors lead to the general instrument storage room. Flush doors, when closed, conceal storage along one whole end of the band room



Looking into the instrument storage room from the music hall of the West Lafayette Senior High School. Note uniform storage

tant that uniforms be protected from moths, it is even more important that they be protected from dust. Storage provisions should include small compartments that are numbered for band uniform caps, and some compartments should be provided for stoles and dickeys.

Equipment in Music Library Room

The music department library should be supplied with ample equipment, so that any stored music material can be obtained without delay. A music library well equipped and administered systematically is a real asset to a music department.

Electrical Equipment

Electrical apparatus is playing more and more an important part in educational programs of public schools. The field of electronics is so great and relatively so unexplored that one is unable to prophesy just what the future will hold for education in the way of electric aids, particularly in music.

Radio

Perhaps at present radio is doing most to benefit music education. It is an asset to music appreciation, and it has been used successfully for instrumental music instruction. Because of the rapid development of frequency modulation in recent years, it is difficult to suggest the best type of radio for the school music room. Perhaps the safest procedure would be to use a combination AM-FM set. Certainly more flexibility would be possible.

In planning new school buildings, the radio installation should receive proper attention whether imme-

diate installation is contemplated or not. Because most buildings today are constructed with concrete floors, the cost of later installation of outlets is almost prohibitive.

Public Address System

A central sound system has become a necessity, not only in the training of students, but also in efficient business management of schools and in the manifold recreational activities which are a part of the general school program. It is wise to purchase a system that is nationally known and is represented locally by a reliable dealer who will provide dependable service.

Central sound systems may be of the one-way type, which means that the rooms in which receivers are placed can hear only that which is sent from the central unit; or they may be of the two-way type, which means that sounds can be sent from the room back to the central sound system. The two-way system has proved more satisfactory.

Many music departments are part of the central sound system of a school building and benefit greatly therefrom. Some, however, have separate systems of their own. Some are so installed that they may be connected with the main unit of the larger central system. Central sound systems in music units or departments have proved very successful, especially in the separate music building or wing of a main building where there are several rooms devoted to music.

Phonograph

Generally speaking, the combination radio-phonograph is better for music departments than separate instruments. With the amount of money which would be required for two instruments, it is possible to obtain one that combines the features of both and is of much better quality.

Recording Machine

The development of the disc recorder has been one of the most interesting and helpful advances in sound equipment as far as school work is concerned. The opportunity that is afforded through recording equipment to reproduce immediately any type of sound by individuals or by groups is of great value. Not only can the individual effort of the student be recorded, reproduced, and studied, but it is also easy to file these discs as a permanent record of the progress of the student in speech, dramatics, or music. In no other way can the music student so clearly realize his deficiencies.

It is possible to purchase recording machines with built-in radios. These afford not only a higher quality receiver, but also make possible transcriptions of radio programs for playing as often as desired.

Loudspeaker Systems

Technically, loudspeaker systems are not part of the physical equipment of the music department. However, because of the frequent need for announcing concerts and less formal programs, it is the normal concern of music directors to have good help from this equipment. It is wise to secure loudspeaker systems made by well-known manufacturers and distributed by established dealers who guarantee and service such equipment. Sets obtained should be strong enough in output of power to reproduce faithfully both indoors and outdoors without distortion. Usually the greater the wattage the better the performance. Most good loudspeaker systems are equipped with three or more microphone inputs, dual turntable connections for continuous playing of phonograph records, adjustable setting devices for different ohmage of speakers, and internal parts that produce high fidelity of tone.

Chromatic Stroboscope

The chromatic stroboscope is primarily an instrument for testing the intonation of wind instruments. It has also been found adaptable to a wide variety of uses where accurate measurement of frequency is involved. Tuners use it. Some teachers of music strongly recommend it for ear training.

Electric Metronome

The electric metronome is a great help to teachers of music. Different pulsations are easily and accurately obtained by a simple adjustment of a knob dial. This electrical device is an improvement over the older pendulum, spring-wound type.

BASIC PLANNING FOR CAMPING AND OUTDOOR EDUCATION

By L. B. SHARP

Director, National Camp, Life Camps, Inc., New York, New York

IF camping and outdoor education are to become an integral part of the school program and plant, it will be necessary for the school administrator to take the initiative and do the preliminary basic planning. He is the most important person, as he must visualize the educational possibilities of the out-of-doors both near and far from school and relate them to the school curriculum. How he does it, either by his taking the lead or working through committees of the teaching staff and lay committees, does not matter. After the initial planning by the school executive, any program of building and development will require the services of architects, engineers, builders and various other specialists.

As in any building program, the fundamental thesis is that program must determine structure. What is built depends upon the use it is to have. This thesis holds in camping and outdoor education just as definitely as it does in any other field. Plan the program first, then decide the structure, its type and size, to carry out the program.

Influence of Buildings on Education

In considering an outdoor program, we must see clearly the relationship between outdoor and indoor education and the way in which they must merge.

Much of the content now included in the school curriculum was originally passed on to succeeding generations by other agencies—most important of which was the home. In and around the home, education was in terms of reality. When school assumed responsibility in this field, verbal and textbook discussions took the place of real experience—and to this extent the educational life of the child was impoverished. City children especially have been deprived of many basic human experiences that add meaning to living. Life to many of our American youth is a second-hand, packaged affair from the store shelf.

No one can deny that great strides have been taken in the construction of school buildings. The functional building of today is safer, healthier and better suited to classroom purposes than its little red grandparent. But this progress has not all been to the good.

School buildings soon became "standardized"—looked alike—built alike—were alike—see one and you saw most of them. In fact there was a definite movement to standardize construction. Designing school buildings was a cinch. There was not much room left for originality and little need to be concerned about the school program.

Along with standardization of school buildings has come the standardization of experiences and school studies. In recent years, there has been a marked improvement in the designing of our more modern schools where there is ample land around the buildings, but the general pattern is the same. Wherever there is vigorous broadening of the curriculum as in the case of a community-centered school, there will be noted some basic changes in the design of the school buildings. In general, however, the school curriculum at all levels and in all subject matter areas is intended to be taught in the school buildings.

In an effort to provide more learning through direct experience, in a trend toward realism in education, more school work will be carried on in the out-of-doors and in school camps.

The school executive, teaching staff, boards of education, school architects, and all concerned need to give careful consideration to projected plans for school structures. According to recent estimates, the American public will spend more than four billion dollars for new school buildings in the United States. Before this vast sum is put into brick, stone, cement and steel, what is to be taught in these new structures should be evaluated in the light of future needs of our youth and our country.

What Outdoor Education Means

Since schools began in a building, a precedent was established. Nearly everything that was added to the school program was adapted to the classroom. However, with the advent of the community-centered curriculum, functional education, field trips, work experience, and school camps, the educational trek to the out-of-doors is under way.

The out-of-doors begins as soon as the school door is closed and the children and teachers are on the outside. The out-of-doors is a big place and gets bigger the farther one goes. Nearly all of the subject matter included in the school comes from outside the classroom. It is compiled in books, pictures, and lesson plans. The children read, study, and recite. Changes are taking place rapidly, however, and forward-looking educators are seeing the wisdom of taking youth to direct sources wherever possible for the best learning.

It has been proved that children learn most through direct experience, learn faster, retain longer, and have a deeper appreciation and understanding of the things they experience. This is known as realism in education. The essence of outdoor education means taking the children to the original source material wherever possible. There is much learning that can and should go on inside the building, but from the standpoint of outdoor education, subject matter should be divided on the basis of where it can best be learned

—inside or outside. School progress has been enhanced when lifelike projects have been brought into the school, but we are saying here that it is more realistic and better education to take the children to the real projects wherever possible.

As an example, a group of grade and high school youngsters in California used their Saturdays to explore the valleys and mountains for paleontological treasures. The motivation was stirred from within themselves, but their natural quest of exploration and discovery was not a part of the school program. If the school adopts the outdoor education philosophy, students would go in quest of these discoveries as an educational venture and would have teacher-leaders who would have been trained in such explorations. On the present basis, however, someone else experiences the real learning part and assembles the information to be studied and taught in the classroom.

Facilities Are Not a Problem

Every school in the country can begin immediately using the outdoors to implement school studies. Very little, if any, facilities would be needed. It is primarily a program of utilizing the immediate environment. To a certain extent, the community school has followed this plan in the development of its course of studies. Various school groups, even within a class period, can go on short exploration trips for art, writing, studying community health problems, housing, study of trees, social studies, and many other important items that relate directly to their school subjects. In a certain school, the geography lesson for that day was about contours. The teacher drew lines on the chalkboard to illustrate what contours were. The teacher could have taken the children outdoors and used the direct experience method. Since she was not trained in the management of children in outdoor situations, nor in how to use the land as teaching material, she stayed inside.

Longer trips might include a half day or even a full day of study and explorations. This would give the children opportunity to plan their lunch and to cook it over an open fire. If the trips away from school include camping out one or more nights, suitable places to camp would be needed. Shelters would be required in inclement weather and during the fall, winter, and early spring. Many parks provide shelters and sleeping cabins. If not, suitable facilities could be built as a part of the city or community park system. If the school owned wooded land, these facilities could be planned and constructed as a part of the school program.

Taxes Should Pay Cost

The school camp is a part of the total outdoor education program. It is as important a part of the school plant as classrooms, libraries, shops, laboratories, and athletic fields. If the camp program is educationally sound, children of the community are entitled to its offerings on the same free basis as that of the rest of the school program. Public schools are supported by taxation, and, therefore, as a part of the school plant, the school camp should derive its chief support from tax funds. Teachers are almost entirely prepared for instruction purposes in the school buildings. It is right that they should be trained also for carrying on the education program in the school camp. This should be as much a part of their regular duties as any part of their teaching load. However, proper adjustments should be made for their vacations and time off.

The school provides lunches through the school cafeterias and at cost. The camp should provide meals at cost. But, in addition, the children should participate in the making of menus, marketing, raising some of their food, cooking, and cost keeping. The children in school who cannot afford to pay the cost of the lunch can receive it for reduced prices or free. The school camp could do the same. The children could be provided with morning and evening meals at camp as cheaply as they could be fed at home and also be assured of a properly balanced diet.

The school provides free transportation for children who live certain distances from school; therefore, it would be right for the school to transport the children to camp.

The school furnishes materials, equipment, and supplies, books, some uniforms, tools, and numerous other articles for school use; likewise, school could furnish these in the school camp.

The school board provides tax funds for the purchase of property and construction of buildings; by the same token, they would be authorized, unless restricted by law, to purchase property and build

Courtesy of the National Recreation Association



Nearby parks offer excellent facilities for camping

Courtesy of St. Mary's Lake Camp



In school camps children learn to work together. They experience many new things not possible in a school building

and maintain camp buildings as an additional part of the school plant.

Examples of School Camps

In all probability, the school camps will be developed quite extensively on a county basis. In this way a number of communities could go together under county sponsorship and acquire a larger tract of land. The construction and operation costs would be less for each school. There would be the added advantages of groups of children from various schools living in camp together. In the county school camp, as in others, they should have at least a part of the camp set up so that it could be operated during the winter

The planning for the county school camp program could start with the appointment of a county camp committee to study and promote the idea. Such a committee is very active in Nassau County, Long Island, New York.

In San Diego County, California, they have established a county school camp where groups of children from the various schools spend a period of their school time at camp. They live, work, study, explore, and experience many new things together not possible in a school building. They discover and examine many of the things they read about in their books.

Similar programs are carried on at Clear Lake Camp at Dowling, Michigan, operated by the Western Michigan College of Education, and at St. Mary's Lake Camp, operated by a Camp Community Board. The school camp movement was inaugurated in these areas in 1940 by the W. K. Kellogg Foundation. At Clear Lake and St. Mary's, the schools of the nearby communities cooperate in the camp project, and teachers with their children spend two weeks at a time in camp throughout the school year.

At Parker District, North Carolina, the school board owns a 100-acre tract of land and operates a school camp. Other communities where some progress has been made in the school camp movement are Atlanta, Georgia; Ann Arbor, Cadillac, and Dowagiac, Michigan.

Other Agencies Can and Do Cooperate

There are various other types of camps already in existence that can and do cooperate with schools. Conditions vary in each community. There cannot and should not be any one pattern established for the developing of the school camp project. This is the democratic way. Therefore, such camps as the 4-H Clubs, Future Farmers of America, the Boy Scouts, the Girl Scouts, the Y.M.C.A., the Y.W.C.A., and numerous welfare agency camps can fit in to the community school camp program.

At Jackson Mills, West Virginia, the 4-H Club has established a camp project in which groups from surrounding areas cooperate. The camp, which covers 523 acres of field, forest and playground, mountain-locked in a beautiful valley, provides the setting for meetings of educators and youth leaders each year.

Teachers Colleges Are Inaugurating Programs

In the field of teacher education, interesting developments have been made by eighteen teachers colleges

in New York and New Jersey. These colleges have participated in a special camping education institute at National Camp during June by sending faculty members and groups of students to get a ten-day experience in camping as a part of their teacher preparation. Many of these colleges have camps, and others are developing plans. The State Teachers College at Plattsburg, New York, has recently acquired a 750-acre tract of land and is developing it as a part of the teacher training program. The State Teachers College at Oneonta has acquired a camp site. Fredonia has a camp. Many of the colleges, such as those in Trenton, New Jersey; Glassboro, New Jersey; Oswego, New York; Lewiston, Idaho; and Tempe, Arizona, have at least made a beginning and are now planning to extend their outdoor education programs.

Planning Grounds, Buildings, and Equipment

In planning and designing a school camp and carrying on its program, the youth should have an opportunity to participate. This does not mean that consultants, architects, engineers, and other specialists would not be needed, but the youth should do as much as possible because of the learning values that they would get from it.

In planning grounds, buildings, and equipment for a school camp, there are several basic matters to be considered.

Selecting the Site

First of all, as much land as possible should be acquired. The site cannot be too large, but it certainly can be too small. Although a hundred acres might be adequate for a beginning, it would soon be wholly inadequate, and the original investment would be partially if not wholly lost. If a community had several camp sites, some could be nearby for easy use in wintertime and for day trips. In general, however, it is well to be far enough away from the city to be isolated from city influences, traffic, and other annoyances. There is plenty of unused land in this country. Therefore, school boards should not have any difficulty in finding suitable sites, providing they know what they are looking for.

The camp site should have distinctive features of natural beauty—woods, streams, open spaces, hills or mountains, and tillable land. This varied type of property would offer many opportunities for exploration and study, which is extremely important. It would be desirable to have a lake on the property, though that is not absolutely necessary. A lake can be made if there are streams on the property.

An adequate supply of drinking water is essential. Almost any land, however, will provide ample water by drilling wells. Only through a survey of the property can accurate information be secured concerning the water supply.

The land where the buildings are located should be well drained and cleared of heavy undergrowth. There should be ample open areas as well as shaded areas.

In considering the camp site, it is well to take into consideration present highways, or projected roads, electrical high tension lines, aviation fields, and other developments which might easily become a detriment to the camp program.

There are various ways in which property can be acquired for school use. When a community through its school board decides to establish a camp, there should be a special committee appointed, armed with full details of the program and guides for selecting property.

Planning the Camp Buildings

After the camp site has been selected, it should be carefully evaluated in terms of the location of the various structures needed. In laying out a plan for development of the camp property, a master plan should be projected. The number of buildings will depend upon the size of the property and the number of campers to be served.

The school camp should be a place of freedom and restfulness. Therefore, congestion of buildings should be avoided. The camp should be broken up in small areas so that the campers could live in small independent groups. A plan of decentralization should be followed rather than one of centralization.

The entrance to the camp should give an atmosphere of openness and not a feeling that there are a lot of buildings. All structures should be as secluded as possible to preserve the naturalness of the area. This would be in contrast to most camps where, upon entering, one sees huge athletic fields and a lot of buildings clustered together.

All roads and trails should be laid out as naturally as possible, avoiding the appearance of city landscaping.

Since the program must determine the structures, the buildings should be designed to fit into the land-



Camp site with a lake provides opportunity for exploration



Land here is well cleared of heavy undergrowth and has ample open areas as well as shaded areas. The cabin, secluded, rambling, and built of logs, is in keeping with the naturalness of the surroundings

Courtesy of Tappan Junior High School, Ann Arbor, Michigan

scape. They should be in keeping with the woods and open spaces rather than have the glaring appearance of a type of structure commonly seen on the school grounds or in the city. Tall, massive, spectacular structures should be avoided.

In the village, or central service area, the buildings should be of a permanent nature, but, even so, they should not be intended to last more than fifteen to twenty years. All the main buildings should be planned so that some additions can be made as needed.

Insofar as possible, native materials should be used in all construction. This is important from the standpoint of fitting into the landscape and of creativeness. The basic native materials are wood, stone, and earth. Use of the property to produce lumber would necessitate a program of conservation, and this would be highly desirable as a school project. Native stone should be used wherever possible in the construction. Care should be taken that the stone surfaces should not be scratched. In some sections of the country, the use of earth plays an important part in construction. The design for the structures should vary according to the different sections of the country. Certainly New England is not the place for the western adobe type of structure.

Opinions will differ as to the treatment of the exteriors of the buildings, but paint does not fit in with the woods and open spaces. Protective oils are more in keeping.

Laying Out the Site

Since the school camp is for educational purposes, it should be laid out on the lines of a small community or village. American youth does not have a chance to be responsible for community management. In cities laws, homes, recreation stops and goes are provided by adults. The school camp can furnish a place where youth can be responsible to a large extent for running its own affairs, always with the guidance and leadership of the teaching staff. Unless the layout of the camp makes this possible, the basic planning is wrong.

The central part of the camp area, therefore, will be set up on a village plan which provides the basic structures, namely the administration building, the dining hall which includes the kitchen and the food store, the village town hall or meeting place where indoor activities can take place and which will have space for a library and conference rooms, the infirmary or hospital, the warehouse or storage space, the shop and garage, the quarters for staff and help, the living quarters and shelters for campers, and the water supply, sewage disposal, power and light services.

The administration building should be the first structure seen on entering the camp property. It should include ample space for the director's office, staff, and clerical workers. Storage space for supplies and conference rooms should be provided for. This building should be winterized so that it can be used throughout the year, and, of course, it should have good fireplaces.

The dining hall can be a permanent year-round building designed in size to seat the entire camp. There should be ample window space and facilities for assembly room or extra activities in case of inclement weather.

The kitchen should be an integral part of the structure. The working areas should be laid out for the

greatest efficiency; it should be well lighted and ventilated and have ample refrigeration space. If possible, there should be a basement under the kitchen to provide space for large supplies of food.

The camp store should be an integral part of the structure, with easy access to the refrigerator and supply shelves. It should have shelves for groceries and a regular store counter. *The dietitian's office* should be a part of the store plan to provide close contact with the kitchen and the store. *The camp's bank and post office* can be placed in the store.

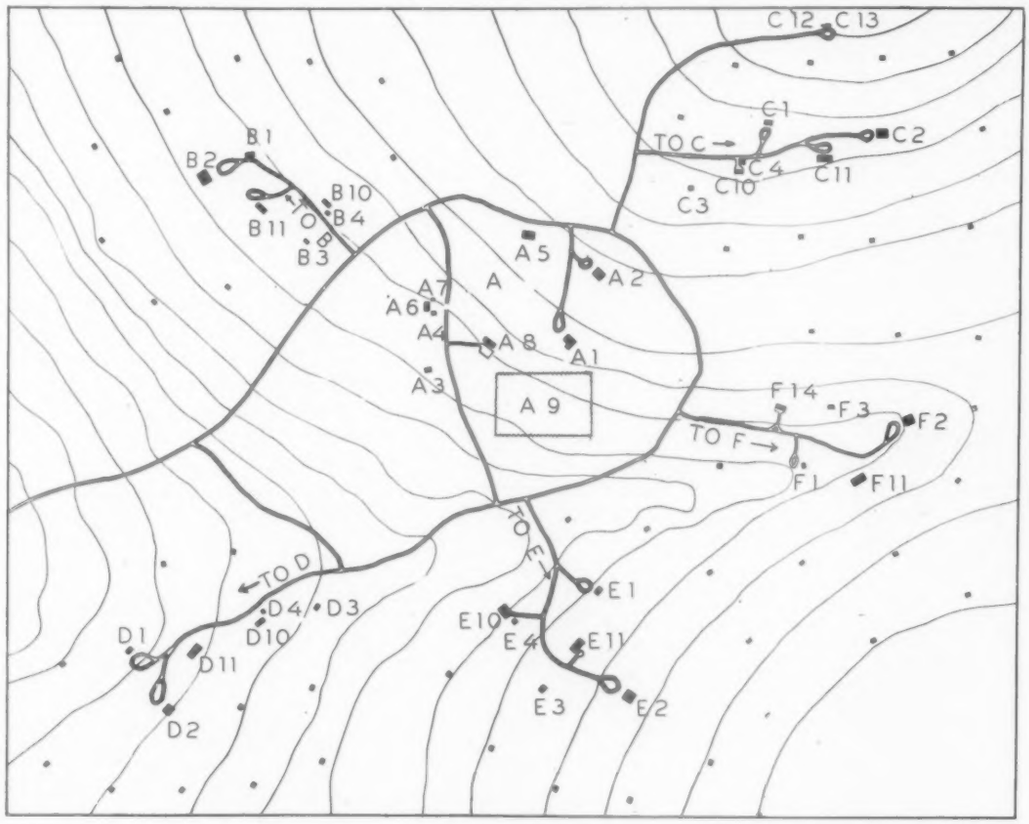
The village meeting place—this is a general utility building, taking the place of the village town hall—can be used for assembly purposes, recreation, and numerous other indoor activities. If the building is designed properly, *the village library* can be a part of it, but should be a separate wing of the building. If possible, however, the library and conference rooms should be in a separate building. Suitable fireplaces are important.

The infirmary should be some distance from the other buildings to insure isolation and quiet. The size of this building will be determined by the nearness to hospital facilities and the number of people in camp. It should contain a small waiting room with fireplace, examination room, small kitchenette, adequate facilities for hot water, showers and tub bath, supply room for towels and linens, isolation rooms, and ward rooms. It is important that this building be designed so that additions can be added on without destroying the general outline of the structure. There should be comfortable quarters for the camp doctor and for the nurse.

The size of the *warehouse* building will depend upon whether or not the campers supply all of their own bedding. Ample supplies, however, should be provided for the storage of mattresses, pillows, blankets, and linens. This room should be made vermin proof and well ventilated. Space should be provided for the storage space for the campers' city clothes while they are in camp. Additional space should be provided for the storage of numerous items of camp equipment that need to be put away for the winter.

Shop—garage—ample space should be provided for the storage of all cars and trucks. A repair shop should be provided as a part of this structure. However, an additional small building is desirable for the village blacksmith shop to be used not only by the maintenance crew, but also for instructional purposes of the campers.

Quarters for staff and help—suitable living quarters for the director and staff should be provided. The



Indicative of the possibilities of a school camp site is this plan, drawn up in 1942, for a village to accommodate 10,000 school children evacuated from the city. The plan was submitted by Life Camps to the New York City schools

Legend:

A-1 Administration
A-2 School
A-3 Service living quarters
A-4 Garage and workshop
A-5 Store
A-6 Warehouse
A-7 Blacksmith's shop
A-8 Hospital
A-9 Village farm area

B-1 Administration
B-2 School
B-3 Service living quarters
B-4 Garage and workshop
B-10 Supply building
B-11 Dining-kitchen-store

C-1 Administration
C-2 School
C-3 Service living quarters
C-4 Garage and shop
C-10 Supply building
C-11 Dining-kitchen-store
C-12 20,000 gallon tank
C-13 Pump house

D-1 Administration
D-2 School
D-3 Service living quarters
D-4 Garage and workshop
D-10 Supply building
D-11 Dining-kitchen-store

E-1 Administration
E-2 School
E-3 Service quarters
E-4 Garage and workshop
E-10 Supply building
E-11 Dining-kitchen-store

F-1 Administration
F-2 School
F-3 Service quarters
F-11 Dining-kitchen-store
F-14 Service

Note: Small rectangular dots represent neighborhood homes, each home to have its garden nearby

director should have separate quarters, and provision should be made for his family. Additional quarters for the staff will depend upon local circumstances. If funds permit, separate quarters would be more desirable. However, a combination providing for two or three staff members would be satisfactory. All of these structures should have a homelike atmosphere and be kept within the spirit of camping. Adequate quarters should be provided for the caretaker and his family near the service area; though off by itself the quarters should be where the caretaker will be in the best place to look after the camp property, the animals, and the garden.

The structures for campers and counselors will depend upon the section of the country and the seasons during which the structures are to be occupied. A part of the camp, however, should be set up so that it can be used all year. The cabins or shelters for year-round occupancy will need to be winterized and provision made for small stoves for heating. In some areas, these structures could have central heating, though that will tend to bring the buildings closer together and create undesirable centralization.

For summer occupancy, the camp shelters should be so simple that the campers can plan, design, and construct them themselves. These structures might include tepees, lean-to's, round-to's, covered wagons, hogans, covered sleds, tree houses, long houses, and other types yet to be invented. Tents and cabins are acceptable, though the school camps will find greater educational results when the campers themselves have the chief responsibility for building their own shelters.

Water supply—after the camp well is dug and an adequate supply assured, the pipe lines for the main camp buildings should be laid under the ground, depending upon the section of the country, so that water will be available in winter as well as summer.

Sewage disposal—the type of sewage disposal plant will depend upon the condition of the soil and the section of the country. In the village area, a central sewage disposal plant would be best. The type of plant and its location is a job for the engineers in the section of the country where the camp is located. Adequate toilet facilities should be included in all permanent buildings and installed so as to operate throughout the year. Toilet facilities for summer occupancy will depend upon local circumstances. Small unit toilet facilities, septic tanks, and individual latrines for small groups should be provided. Where there is a predominance of rocks and gumbo soil, pit latrines are not advisable. Consultation with health authorities and a local sanitation engineer is essential in the planning and use of the sewage disposal plant.

Power and light—if local electricity is available and near enough, electrical power lines should be brought into camp to serve the village area and the main buildings for light and refrigeration . If outside power is not available, a gasoline generating plant could be installed.

Legal Provisions for School Camps

In a number of states it is possible for schools to acquire property through existing state departments such as the department of conservation, the state land office, and the park departments.

In Michigan, for example, 357 schools own a total of approximately 45,000 acres of land (being an average of 126 acres per school), where tax-free school forests have been established. This land was obtained by gifts, bequests, or purchase, and some of it was obtained through the Michigan Department of Conservation and some of it through the State Land Office. These offices can deed tax delinquent land for municipal forest areas. The schools use these forest areas for the study of reforestation and conservation and development; also, to provide opportunities for experience and study in natural science as well as other related fields. Too, the forest areas provide ample opportunity for acquiring work experience.

That camping and outdoor education is accepted as an integral part of the school curriculum is evidenced by the increased interest on the part of state departments of education in securing the necessary legislation authorizing boards of education to acquire property for the establishment and operation of school camps. Recently, the states of New York and Michigan have established such enabling laws. The New York State school boards and districts provide that all children of school age, attending either public schools or non-public schools, will have an opportunity for camp experience as a part of the school program. The law mentions a two-week camp period for each youngster, unless each school would choose to extend the program.

The school camp bill that was passed in Michigan in 1945 provides that any school district except primary school districts may operate and maintain camps as a part of the school program. Also, it provides that school districts or communities may combine for a joint school camp project. It is left up to each school board to determine the age and other entrance requirements for attending camp. Further, it provides that fees may be charged to cover all of the operating and maintenance costs of the program, providing of course they are operating without a profit. The Michigan school boards are authorized to acquire, equip, and maintain the facilities and employ the necessary persons for operating the camp program.

In the passing of these two state laws pertaining to school camps, a basic principle in education has been established. It is the recognition that education out-of-doors and camping is sound education. It provides for worthwhile learning that cannot be provided for in the regular school curriculum or buildings. It also establishes the principle that it is right to support this phase of education through tax funds on the same basis as that by which the accepted school program is supported by taxation. It also implies that school administrators and teachers should be prepared to carry out this program, and as a part of their training, the camping and outdoor education phase of it must be included in the curriculum of the teachers colleges throughout the country.

Now that the pattern is set for legal provisions for school camps, no doubt many states throughout the country will move rapidly into this field of education. From the standpoint of planning both program and construction, a very large and significant field is opened up for administrators and planners. May the planning and construction be done so that education will not again have a holocaust of "standardization," this time in the woods and open spaces.

DESIGNING THE MATHEMATICS CLASSROOM

By FRED L. BEDFORD

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UNTIL rather recently there were many teachers who thought that mathematics could be taught effectively in a room which had only desks, seats, blackboard, chalk, and erasers. They did not fully realize that effective learning is the product of a multitude of experiences rather than a multitude of repetitions of as nearly the same experience as it is possible to achieve. Textbooks are still being sold on the theory that the best book is the one which provides the most opportunities for a repetition of certain number facts.

Today we know that equipment is essential in the teaching of mathematics. We know that the physical features of the room can be such that they assist in the learning process. Such factors as proper lighting, adequate ventilation, and suitable seating have much to do with the work habits of students, and, in consequence, these items affect the quality of their learning.

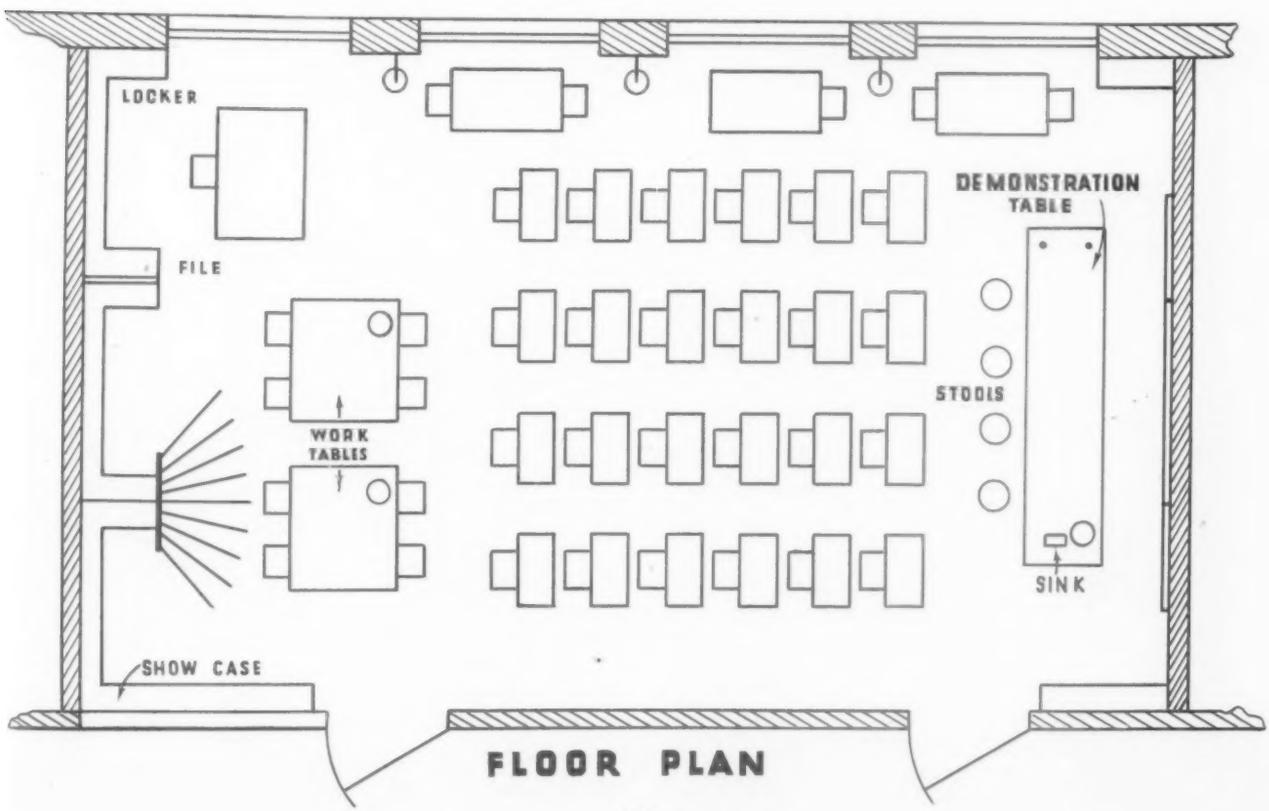
Teachers Suggest Classroom Improvements

Perhaps everyone is aware of the sharp contrasts in seating, lighting, and general equipment between today's classrooms and those of a few decades ago. However, few rooms have been planned so that mathematics can be taught and learned best. School building engineers too often have made all rooms alike except the science laboratories and manual training workshops. The general arrangement of a classroom depends upon the subject to be taught. The designer needs teacher guidance to know the amount and kind of space to allow for the materials of instruction which are thought desirable. Wherever the classroom teacher has been consulted, splendid improvements have resulted in the physical features of the room.

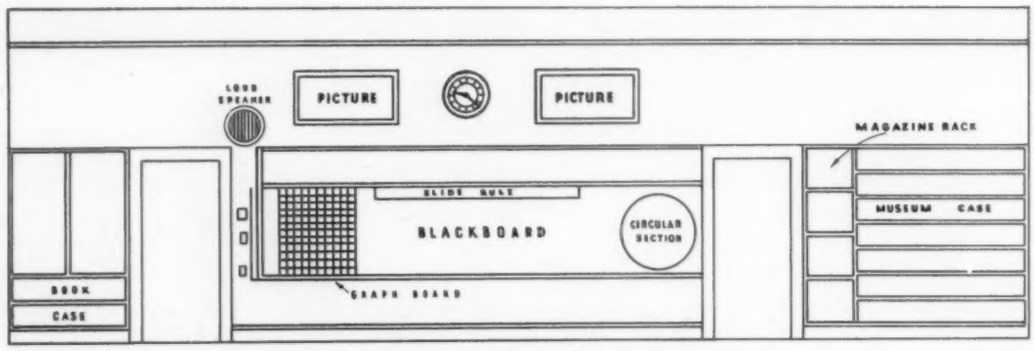
The thinking of many of our best teachers about how a mathematics classroom should be arranged and equipped is included in the accompanying floor plan. The suggestions should be of considerable interest to building planners.

Features of Floor Plan

Desks and chairs are arranged for 24 pupils. Work table space is arranged for half the pupils at one time. Ventilation is controlled through ducts from a central unit. Windows are sealed, and there are no radiators.



FLOOR PLAN



INSIDE WALL ELEVATION

The plan of utilizing the spaee near the windows is unique but efficient. A brief discussion of some of the other singular features of this plan follows:

Demonstration Table and Work Tables

It has been the custom to use the teacher's desk for space for textbooks, reference books, secretarial work, student conferences, and demonstrations. In this planned classroom, each of these desirable activities has a separate place. The teacher's desk now becomes the teacher's place for personal work. A real demonstration table supplied with water, sink, electricity, and supports for experiments in mechanics permits experimentation preceding generalization. The work tables provide space for work in groups, for using calculation machines, or for performing experiments.

Storage Space

How dear to the heart of an experienced teacher is adequate storage space. In this room, care has been taken to provide ample space for graphs, charts, tests, reprints, demonstration units, apparatus, supplies, records, and other teaching aids. Flat work can be stored in the drawers in the work tables.

Display Space

Most mathematics rooms need more space for displaying pupil work; good teaching includes granting proper credit for achievement. The space should be at pupil eye level. A built-in multiplex fixture provides the greatest economy of space and is unobtrusive. Ten leaves, 3 by 2 feet, provide 120 square feet of display space, or as much as a bulletin board 4 feet wide and 30 feet long. In addition to the work of pupils, the material to be displayed can include newspaper clippings, charts covering topics such as the public debt and the use of tax money, and tables of vital statistics.

Removable panels at either end of the room for displaying posters, charts, and pictures made by the students will challenge them to put forth their best creative efforts. The panels slide into grooves at top and bottom. Each panel is bored with a small hole, so that it can be put into place or removed with an ordinary window pole.

To popularize mathematics throughout the school, bulletin board and glass-enclosed exhibit space should be provided outside the classroom in the hall. Depending on their pertinence to the work of the department, such items can be shown as the Roman groma, Platonic and Archimedian solids, star polyhedra, calculating machines, Napier's Bones, and dice and chance machines.

Library Materials

Every mathematics library should include supplementary textbooks in mathematics, physics, astronomy, meteorology, and navigation. The books and magazines listed at the end of this article, the yearbooks of the National Council of Teachers of Mathematics, puzzle books, and the popular treatments of mathematics by men such as Jeans, Eddington, Bell, and Keyser belong in the library.

Chalkboard Arrangement and Equipment

Modern classrooms need a cross-section board, a movable circular section in the plane of one chalkboard, and a large spherical chalkboard for demonstration use, as well as several small spherical chalkboards for student use. They should also have colored chalk, compasses, stencils, protractors, gravity protractor, meter sticks, proportional dividers, T-squares, triangles, and the normal probability curve.

A motion picture roll and two curtains hung above the chalkboard make it possible to cover the board when that is desirable.

Multisensory Aids

The progress in using teaching aids of all kinds has been so great that one now expects to find a moving picture camera and projector in the classroom as part of the permanent equipment. One can rent splendid reels on mathematics, and it is also desirable to have the students plan and make their own films.

The motion picture camera and projector do not supplant the projection lantern and the opaque projector. When only one copy of any material is available, the opaque projector is particularly useful in showing the item so that the pupils can see, interpret, and discuss it as a group.

Models of pyramids, cones, spheres, conic sections, other solids and space figures, along with actual weights and measures, are as much a part of proper equipment as is the textbook. Learning does not occur in a void: learning proceeds in a shuttle pattern from concrete to abstract and back again.

Instruments of Applied Mathematics

Objective material necessary in the learning situation in mathematics runs the whole range from apples

and pencils for the beginners to transits and calculating machines and integraphs at the higher levels.

Calculating machines, one for every two students, should be supplied so that long computations can be completed quickly and accurately. When a pupil in a high school mathematics class spends time on lengthy computations he may not be learning mathematics but only to hate mathematics.

The slide rule permits three-figure computations to be made quickly, and, like the calculating machine, it is an interest-catching device. The slide rule is useful in checking computations done in another way. A demonstration slide rule should be placed at a convenient height for pupil use.

Science apparatus consists of pulleys, levers, gears, incidence and reflection apparatus, lenses, mirrors, pendulum, weights, measures, balances, acceleration of gravity apparatus, barometer, and thermometer.

Surveying equipment includes clinometer, hypsometer, angle mirror, sextant, level, transit, leveling rods, arrows, tapes, ranging poles, plane tables, pantographs, magnetic compasses, and suitable papers and charts on which to record the results of measurement.

With such instruments, the directions north, south, east, and west become real. Magnetic meridian, magnetic declination, bearing, azimuth, angles of elevation and depression, level, contour line, triangulation, and indirect measurement can be learned from experience. One concrete experience is frequently all that is necessary to understand the abstract concepts of measuring.

Better Design Leads to Better Teaching

Some mathematics classrooms have scarcely the bare beginnings of what is proper equipment for teaching mathematics. Many rooms can be vastly improved by adding some of the equipment mentioned. To provide suitable storage space in rooms already built, open shelving can be used for certain types of inexpensive equipment, and steel storage cabinets can be purchased for the more expensive equipment.

It is in the construction of new rooms that the best arrangements can be made. With proper equipment, mathematics can be taught so that pupils gain increasing appreciation of it in the interpretation of the physical universe and in the affairs of human living. Here it can become forceful, and here it can affect the pupil's behavior, his financial habits, and his appreciation of the cultural inheritance which is his.

SUGGESTED MULTISENSORY AIDS

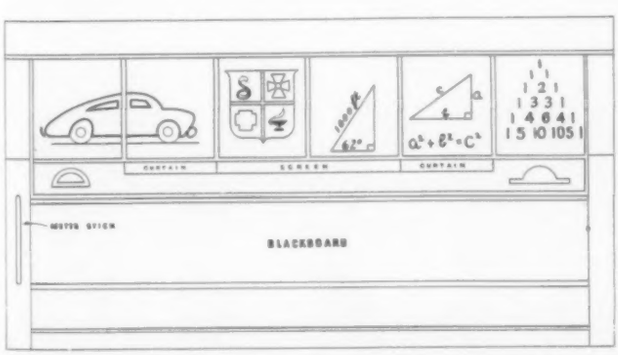
Blackboard Tools:
Blackboard compasses
Demonstration protractor
Gravity protractors
Meter sticks
30°–60° right triangles
45°–45° right triangles
Stencils
T-squares

Bulletin Boards and Display Space:
Clippings on mathematics
Drawings, pictures, maps
Exhibits of how maps are made
Posters
Graphs
Model work

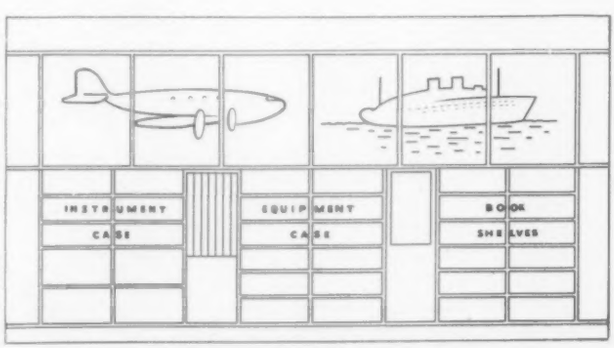
Chart File:
Blueprints
Charts made by previous classes
Charts showing the use of mathematics in conservation, communication, industry, and transportation
Graphs
Gunnery charts
Maps
Pictures of buildings and bridges
Proverbs relating to mathematics

General Equipment:
Opaque projector
Motion picture camera
Motion picture projector
Motion picture screen
Projection lantern
Radio
Slides

Instruments:
Alidades
Astrolabe
Angle mirrors
Arrows
Balances and weights
Calculating machines
Calipers
Circumferenter
Demonstration protractor, 2′ diameter
Demonstration slide rule
Drawing boards
Field protractor
French curves
Gear sets
Hand levels
Hypsometers
Inclined plane
Jacob staffs



FRONT WALL ELEVATION



REAR WALL ELEVATION

Law of lever set
Lens set
Leveling rods
Magnetic compasses
Measuring set—pint, quart, gallon, peck, bushel, liter
Measuring tapes
Mechanical drawing sets
Micrometer screw
Pantographs
Parallel rulers
Plane tables
Planimeter
Plumb bobs
Proportional dividers
Protractors
Pulley set
Ranging poles
Resolution of forces board
Rulers—metric and foot (marked in tenths and hundredths of a foot and in inches)
Seconds pendulum
Sector compasses
Sextants
Slide rules
Spherical blackboard
Spleen curves
Spherometer
Spring scales
Steel tapes
Stop watch
Surveyor's levels
Theodolite
Transits
Triangles
T-squares
Wedge
Wheel and axle set

Library Books:

ABBOTT, E. A. *Flatland.* Boston: Little, Brown and Co., 1915.
BALL, W. W. R. *Mathematical Recreations and Essays.* New York: The Macmillan Co., 1920.
COLLINS, A. *Fun with Figures,* New York: Appleton-Century Co., 1928.
DANTZIG, T. *Number, The Language of Science.* New York: The Macmillan Co., 1933.
HODGMAN, C. D. *Mathematical Tables from Handbook of Chemistry and Physics.* Cleveland: Chemical Rubber Publishing Company, 1936.
HOGBEN, L. *Mathematics for the Million.* New York: W. W. Norton Co., 1937.
LICKE, H. E. *Recreations in Mathematics.* New York: D. Van Nostrand Company.
MERRILL, H. A. *Mathematical Excursions.* Norwood, Mass.: The Normal Press.
PARKER, BERTHA M. *The Story of Numbers.* Washington, D. C.: The American Council on Education, 1932.
POPULAR MECHANICS. *Make It Yourself.* Chicago: Popular Mechanics Press.
POPULAR MECHANICS. *The Boy Mechanic.* Chicago: Popular Mechanics Press.
ROW, T. S. *Geometric Exercises in Paper Folding.* Chicago: Open Court Publishing Co., 1905.
SANFORD, VERA. *A Short History of Mathematics.* New York: Houghton Mifflin Co., 1930.
SHUSTER, C. N. AND BEDFORD, F. L. *Field Work in Mathematics.* New York: American Book Co., 1935.
SMITH, D. E. *Number Stories of Long Ago.* Chicago: Ginn and Co., 1919.
SMITH, D. E. *Our Debt to Greece and Rome.* Boston: Marshall Jones Company.
SMITH, D. E. AND GINSBURG, J. *Numbers and Numerals.* New York: Bureau of Publications, Teachers College, Columbia University, 1937.
THOULES, R. R. *Straight and Crooked Thinking.* New York: Simon and Shuster.
WEEMS, P. V. H. *Air Navigation.* New York: McGraw-Hill Book Co., 1938.
WEEMS, P. V. H. *Line of Position Book.* Annapolis: U. S. Naval Institute, 1928.
WHITE, W. F. *A Scrapbook of Elementary Mathematics.* Chicago: Open Court Publishing Co., 1927.
WOODRING AND SANFORD. *Enriched Teaching of Mathematics.* New York: Bureau of Publications, Teachers College, Columbia University, 1938.

Magazines and Newspapers:

Popular Science
Science
School Science and Mathematics
The New York Times
The Mathematics Teacher
The Scientific American
The Wall Street Journal
Time

Models:

Celestial globe
Contour map model
Dissected cone
Geometrical surfaces and solids
Hamley multi-model geometric construction set
Analytic solids: hyperboloid, ellipsoid, paraboloid, hyperboloid of one sheet, hyperboloid of two sheets.
Platonic solids
Prism and pyramid of same altitude and base
Set of Lafayette screen solid geometry models
Sphere
Sphere in sections
Sun dial

Museum Case and Show Case:

Abacus
Ancient clocks
Ancient surveying instruments
Collection of slide rules—log log, twenty inch, and circular
Gunter's scale
Historical articles and models of interest in mathematics
Models made by pupils
Napier's bones
Project material
Tally sticks

Shelves and Table Drawers:

Graph paper: rectangular, logarithmic, and polar
Mathematics library books
Mimeograph material
General supplies: paper, drawing instruments, colored chalk, modeling clay, Bristol board, pasteboard, etc.
Tracing material

Teacher's File:

Demonstration material
Flash cards
Mimeographed material
Record
Tests

NOTE: For a complete list of multisensory aids in teaching mathematics see the Eighteenth Yearbook of the National Council of Teachers of Mathematics.

ELEMENTARY SCHOOL CLASSROOM DESIGN—SPECIFICATIONS OF TEACHERS

By CORA BEARD, BARBARA BRADSHAW, KATHERINE D'EVELYN, MARY SMITH, MARILYN SPILLANE, AND SARAH WHITE

Committee of the Staff of the Sixteenth District Public Schools, Elmont, L. I., New York

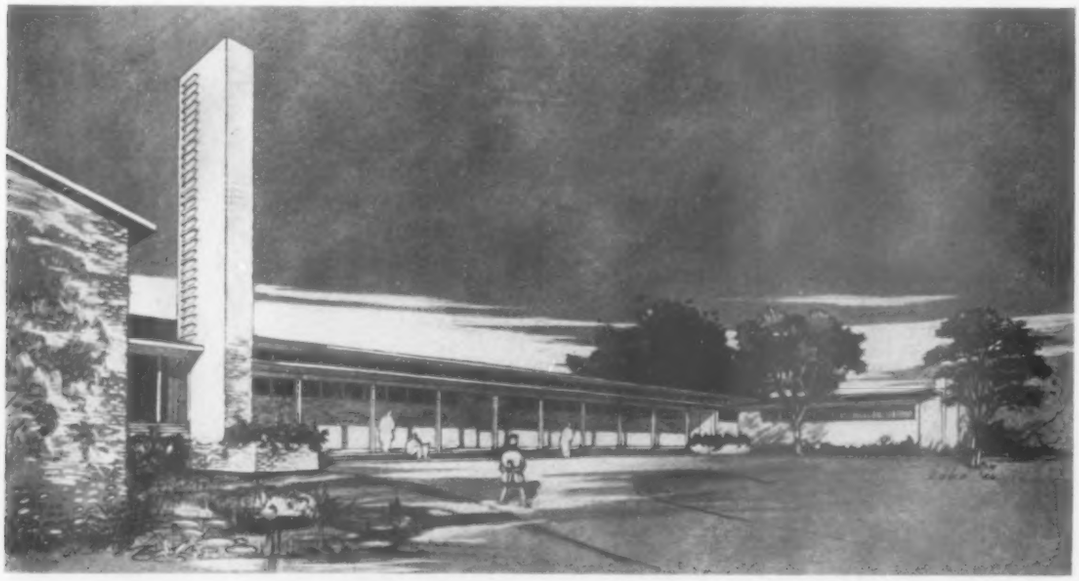
WE are a group of people who use elementary school classrooms. We don't know much about specifications and postwar building materials or ventilation, but we do know something about children and the kinds of things that we should like to have available in a school or classroom so that our work can go on to best advantage.

Build to Scale of Young Children

First of all, we should like the providers of school buildings to think of little children and what they are like, of the things that frighten them and of the things that bring delight. Children will be coming into our elementary schools in equally large numbers at age four, and perhaps three, as they do now at five. Buildings must be built to the scale of understanding of young children; must attract four- and five-year-olds, rather than frighten them away.

Our dream of a well-equipped classroom starts with trees and a path leading through them to a little building. It is a school that is low and small, with intimate atmosphere and inviting entrance, in which traffic has been arranged so that no large groups of children need move much through long corridors. Perhaps, instead of one large building, several small units might be scattered about the site, making the transition from home to school as easy as possible.

Second, we urge that the kind of site and the planning of the development of the site be conceived again in terms of the small children who will use it. A grove of trees, some big rocks, a brook if we are lucky, tall grass—these are educational features of a site that are dynamic, in contrast to a well-kept smooth lawn stretching in all directions from the building, or the back yard desert sometimes referred to as a playground. If the minimum is available, rather than to decorate the front, let's put the trees and shrubs and grass to work in the play area where the children usually are.



"a school that is low and small, with intimate atmosphere and inviting entrance"

Third, think again of small children when the interior of the building is planned. Bring things down to their level. Let's have bulletin boards down where little children can look at them rather than placing them at the eye level of the architect. Bring the

NOTE: Stanton Leggett, acting supervising principal of the Sixteenth District Public Schools, reports the committee's conclusions. The illustrations were furnished by Perkins and Will, architects, of Chicago.

window sills down low enough so that little children can look out of them without having to stand on a box or a chair to do so.

Classroom Should Be Able to Stand Hard Wear

Our classroom is a workroom. It is a place where paint is used, hammering and sawing goes on, cities are built out of blocks, Indians live for a time, mathematics is used, and books are read. Our classroom should be a workroom, one that is easily cleaned, durable, simple; in short a room that can take it. We would forego the beautiful classroom that is too lovely to be touched in favor of the room that can suit all our moods and be unruffled and undisturbed by them all.

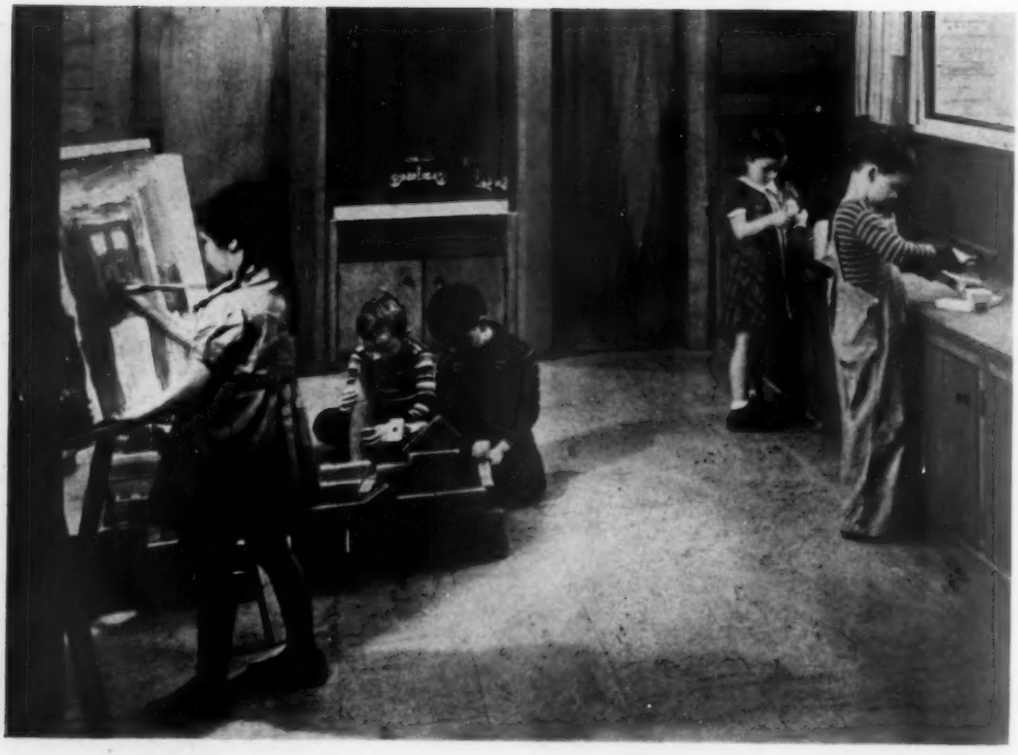
Since we do a lot of work together in that room, we should be very happy to have sound controlled. Ceilings and walls should absorb as much sound as possible. We want a room that is sunny and light and that is smoothly and evenly lighted with artificial illumination. The floors, perhaps cork, should be warm, resilient, paint resisting, and easily cleaned.

Outside Facilities Should Permit Dramatic Play

Since the outdoors is used so much in our daily program, we want direct access to outside for as many



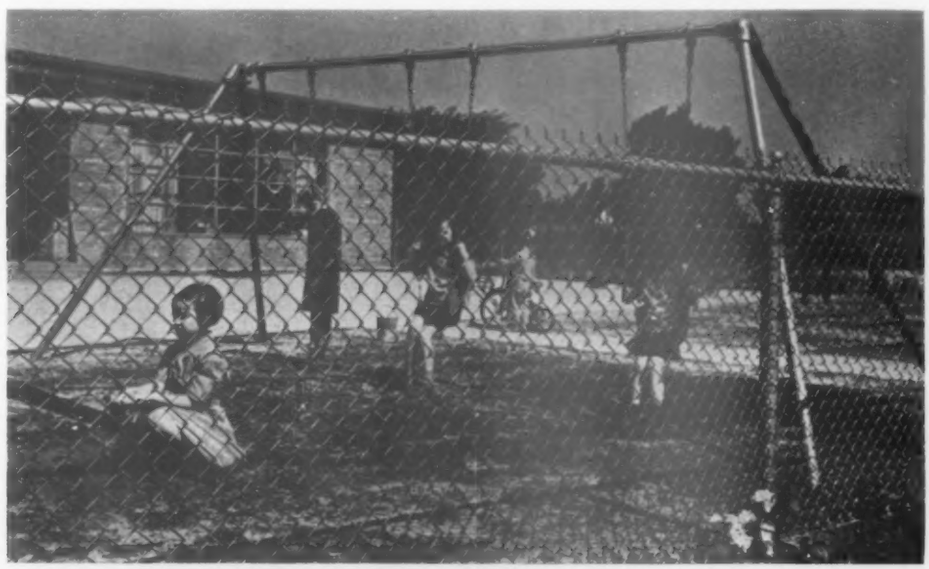
"bulletin boards down where the children can look at them"



"Our classroom is a workroom . . . a place where paint is used, hammering and sawing goes on, cities are built out of blocks"

rooms as possible (and in colder climates, protect us against the drafts that sweep in under doors chilling floors). When those doors are provided, happy will we be if the architect provides ramps to the ground level instead of steps. Barrels and wagons, blocks and toys are moved in and out many times a day. Ramps make it easier for teacher and children together to care for transportation problems.

Now that we are outdoors, a few comments about equipment may be helpful there. Aside from any natural advantages that we hope the site will have, there should be a level play space a section of which is sheltered by planting or a fence for the use of younger children. Here should be a block house, a small building of sturdy construction in which can be housed planks and outdoor blocks and other playthings. The house itself can be used for dramatic play. Perhaps a section of the house may be low with a roof that little children can climb on, gratifying long-felt desires with a minimum of hazard. The house may also serve as part of construction projects and the like. A smooth-surfaced path with turns and an incline or two provides an interesting roadway for the ambitious wagoneer or tricyclist. Jungle gym, slides, and seesaws with perhaps a junked automobile are useful equipment on the grounds. A sandbox is in-



"a level play space . . . an interesting roadway . . . see-saws"



"direct access to outside"

valuable, particularly if it contains space for water sports. It should be protected from sun and have a cover to protect it from neighborhood dogs. A garden section is a place where real education is carried on. And plain dirt to dig in without annoying custodians or board members will add to our program.

Let's Have Individual Toilets; Fireplace

Back inside again, we see each classroom containing specific workroom space where the bench and sink are located and construction activities can be somewhat localized. We also envisage each classroom all the way to the sixth grade having, somewhere in the unit, individual toilet facilities, one for boys and one for girls. The gang toilet room is a thing of the past. Young children in particular were frightened by the sight and sound of the older installation. Control is better achieved with the family-type facilities we prefer.

We like the idea of a fireplace in the classroom. It adds informality and a center of interest. It is wonderful for heavy discussions when the children are grouped around a good fire. We want a fireplace that works or none at all. A firescreen might be built right into the fireplace as a safety precaution.

Built-in Equipment for Young Children

For rooms for the younger children, that is from four to seven or eight years old, window seats are desirable. Don't neglect the possibility for storage



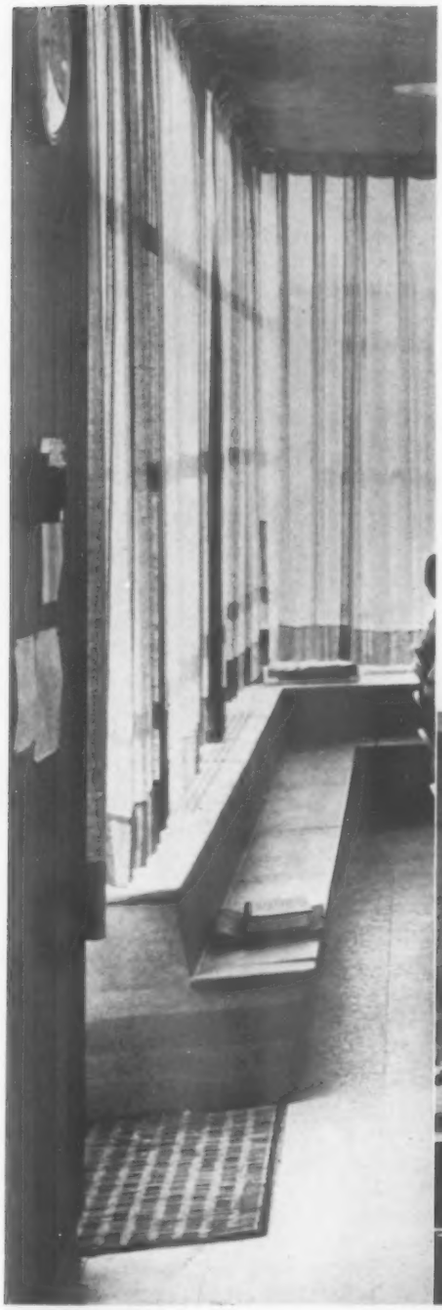


Above—"A garden section is a place where real education is carried on"



Above—"each classroom containing specific workroom space where the bench and sink are located"

Right—"each classroom all the way to the sixth grade having, somewhere in the unit, individual toilet facilities"



Left—"storage space under the window seats"

Right — "Bookshelves should abound"

Below—"a low work bench . . . a sink . . . brought down to the children's level"





space under the window seats. Bookshelves should abound. They should be in a light sunny part of the room and not in a dark corner. Storage space is always at a premium. Open and closed shelving with sliding doors and movable shelves help to meet that need. Block storage shelves are needed through the second grade. These should be planned to accommodate the different sized blocks. Different colors would help identify the storage space for each of the different sizes and shapes.

Bulletin boards and blackboards should be provided and brought low enough for the children to use them. Built-in easels are good too, the kind that swing down from the wall. These are more stable than the movable type. Many of these we have seen are too slanting for little children to use. And a good safe place for paint containers will ease many problems.

Heavy Equipment for Young Children

The workroom should have a low work bench with vises that are easy to use. A sink is needed and should be brought down to the children's level so that they can wash out their own paint brushes. In addition, equipment for simple cooking provides great opportunities for stimulating experiences.

Space for growing plants and keeping pets will be of great use in any one of the elementary school classrooms. The main problem is drainage for watering plants and cleaning pet cages. Heat is a difficulty, for many nature projects are halted by the night and



"Tables should be provided in the sizes that seat two and four"

week-end cold. In providing equipment in which growth of plants and animals can continue unaffected by changes in the temperature, manufacturers will help solve a real problem in schools in colder climates.

Movable Equipment for Young Children

A doll corner is an important part of most programs for the younger children. The components of a doll corner are a doll or dolls; a doll bed, a doll carriage, dishes, cupboard, small table that children can sit at, rocker, chairs, toy victrola, iron, ironing board, wash tub, and washboard.

The library center needs shelves, a round table, and five or six chairs of different sizes.

The room needs tables and chairs to seat the group, a small movable piano, a phonograph, a simple loom, and movable bulletin boards that can double as screens around cots.

Storage

The primary rooms need a storage room with particular emphasis on storage space for cots. Many schools provide rest periods for the younger children, and cots have a way of being a headache unless storage space is provided. The storage room needs much shelving, and some should be at a height that allows the children to share in the storage and selection of materials and equipment.

In general, our classrooms should have electric outlets, and for visual education purposes dark shades are needed in all classrooms. When a simple moving picture projector is invented, teachers will feel more at home in this field.

The teacher needs filing equipment, particularly the built-in type. If this is provided, no teacher's desk is necessary. Instead, an adult height table with two or three adult size chairs (some for the parents that we hope will visit often) may be substituted.

Equipment for Older Children

For older children, we lean to the provision of tables and chairs. Tables should be provided in the sizes that seat four and two children. Drawers so that children can have their own place to store books and other necessary tools of learning should be included in the tables.

Shelving, cabinets, bookcases, and the like are necessary. Storage for maps and globes should be provided. Projects that are developed in the workroom also require space for storage.

Bulletin boards and blackboards are part of the regular equipment.

Workrooms are needed for the rooms housing the older children. Sinks and sturdy work benches are included. Cooking facilities can be provided in the workroom or a central kitchen made available for children. At this level, the plant beds and pet housing facilities add considerably to the program.

Project tables and display space provide opportunities for the culmination of many of the activities carried on in the rooms.

The library corner, possibly with several comfortable chairs, is a center of interest in the room.

Again much of the work can be carried on outdoors. The playing fields and outdoor playground equipment are important. Jungle gyms and monkey bars are standard equipment. Perhaps a small airplane ready for junking can be installed on the grounds. It will offer an admirable place for dramatic play. The sixth grader who can sit in the pilot's seat and play with the controls will fly around the world in his imagination and come back refreshed by it all.

CHALKBOARD AND ITS FUTURE

By PAUL F. NOCKA

Markus & Nocka, Architects and Engineers, Boston Massachusetts

TO evaluate fairly the chalkboard of today, it might be helpful to review a brief history of its predecessor, the blackboard. The earliest and most direct prototype of the blackboard was the waxen tablet used by the Greeks and Romans. This consisted of two wooden framed wax-covered tablets hinged together with wires. These were written upon with a stylus. As compared with the earlier and more permanent cuneiform writing, the relative ease of ironing out the inscribed wax would seem to place these tablets in the category of our present-day chalkboard.

Writing as Popular Skill a Recent Development

In the Middle Ages writing became a specialized art practiced primarily for the purpose of copying and illuminating religious manuscripts. The teaching of writing took place solely in the monastic schools. It is said that the copy the pupils were usually required to imitate was the doggerel line introducing every letter of the then known alphabet: ADNEXIQUE GLOBUM ZEPHYRIQUE KANNA SECABUNT.

Not until after the Renaissance did there appear to be a considerable amount of written work in the nature of exercises. The invention and establishment of the printing press, which created a wide circle of readers, undoubtedly exercised a powerful influence upon the rebirth of writing. At about the same time, the Protestant Hornbook was evolved and was extensively used in both Europe and America until about the beginning of the 19th century. Though the Hornbook was essentially a reading device, its shape appears to have been borrowed from a medieval blackboard, as evidenced by an illustration on a manuscript by Sacrobosco in the 13th century, showing a child holding up a large blackboard shaped like the later hornbook. Records show that by the end of the 15th century letters and theme writing and general composition became a regular part of school work and became even more important by the end of the 17th century after Latin conversation in schools was abandoned. In the 18th century, the Dame's schools introduced writing into the elementary schools, but it was not until the 19th century, when the number of subjects taught multiplied, that writing achieved the position of a medium of instruction. Until that time a good handwriting learned at a special writing school carried with it a favored class distinction; thenceforth mere legibility became the prime consideration.

About 1780, the individual slate and pencil were introduced in America. It is interesting to note that in shape it is almost identical with the Roman wax tablets, and this after a lapse of perhaps 1000 years! Possibly the only advantage of the slate was its more simple means of erasure; it was certainly noisier and less clean than the wax tablet. It is undoubtedly due to tradition and inertia that these unhandy slates were replaced by the much more hygienic paper and pencil only at the beginning of the present century.

Blackboards, as the name would imply, originally consisted of smooth wooden boards, painted or stained black, and written upon with white chalk. As previously mentioned, they appear to have been in use as early as the 13th century; but there is no available information regarding the kinds of blackboards used in this country before 1820. At that time, according to the "Annals of Salem," "Blackboards were used in our common schools, for arithmetical calculations. Manuscripts of sums, set for pupils by their masters, which had continued for a long time, began to be laid aside." However as late as 1839 Dr. Henry Barnard wrote in his "First Annual Report to the School Commissioners of Connecticut": "Blackboards are not uncommon, but are but little resorted to by the teachers."

Blackboards were introduced at West Point in 1817. Seven years later at Bowdoin College an instructor named Smyth used one there with such excellent results that, according to the account, "That novelty made a sensation. The blackboard experiment led to his appointment as assistant professor of mathematics a year later."

Until about 1850, blackboards were either the simple wood type or plaster containing lamp black. Then slate blackboards began to be mounted on walls. Though glass chalkboards appear to be relatively recent in this country, they were already quite common in English schools before 1900. However, the color used was still the traditional black. There seems to be no record of the first use of a light color for a "blackboard" although its inspired originator deserves to be known. Unquestionably this advance is of such significance that henceforth, in the interest of clarity, we should use the word "blackboard" in its strictly limited sense only and substitute the more inclusive word "chalkboard."

As to Color, Take a Cue from Nature

Today blackboards are still so commonplace that a general review is certain to seem trite. Therefore, only their shortcomings will be discussed in the hope that research and experimentation might thereby be stimulated to improve them.

All modern educators are pleading for less formal classrooms and for more laboratories that approach the informality of living rooms, but how can such an ideal become reality while great areas of walls are still being "blacked-out" with a dismal light-absorbing color? Although a dark line on a light background is not as visible as the reverse condition, this difficulty is compensated for by better lighting.

Color is a force, and black is a depressing one. However, the use of white either as a wall color or for the chalkboard can be equally bad. It is believed

that a large, white, intensely illuminated surface exposed to the eye unduly stimulates the retina or fatigues the ciliary muscles of the eye in its effort to accommodate the field of vision. Supporting this theory is the phenomenon of snow blindness, or the noticeable eye strain on a sunny day at a white sand beach. Though these involve intensities far above those reached in a well-lighted interior, they are about the only instances of large white areas in nature, and dead black is actually more rare. Soft greens and creams are available in glass as well as in composition boards, so taking the cue from nature why not use them?

Reducing Source Brightness Cuts Down Glare

When considering schoolroom lighting, it is obvious that the dark chalkboards are wastefully light absorbent. Added to this is the less apparent fact that the contrasting large areas of light wall and dark chalkboard are likely to produce a condition of glare even with comparatively low lighting intensity. This was shown by the Sylvania Electric Products Co. which used one of the elementary public school rooms in Salem, Massachusetts, as a testing laboratory for improving lighting and seeing conditions. Eliminating the dark floor, furniture, blackboards, and bulletin panels was the first step toward achieving control of glare.

This experiment was inaugurated during wartime, and the glass chalkboards as manufactured before the war were unavailable. However, glass panels were obtained with one ground surface and were painted the color of the wall on the back mounting side. As a matter of interest, this color was approximately light peach and was chosen by the Sylvania engineers after numerous colors were tested for the minimum amount of change in color effect when switching from daylight to artificial light. The fact that the warm side of the spectrum showed less "switching" change than the cool colors may tend to ultimately revise the presently popular trend toward greens. Actually, however, this peach color, when filtered through the



The experimental schoolroom in Salem, Massachusetts, before changes were made. The light-absorbing quality of the blackboard speaks for itself





The same room with daylighting and artificial lighting greatly improved. Vertical louvers at the windows are fixed at an angle permitting indirect sunlight and a view of the outdoors. The louvers are hinged at the top to facilitate cleaning



Note below the light colored chalkboard across the front balanced by the light colored bulletin panel on the right. Glare has been reduced in large part by the use of lighter materials, but the dark base is a slightly annoying detail

¼ inch sheets of glass, changed to a slightly greenish hue, though the general effect is pleasing. Also, painting the back side of the glass did produce disturbing third-dimensional effects at the edges and joints which were eliminated in the prewar glass chalkboards, most of which had the color and abrasive fused into the outer surface.

It is interesting to note that the general lighting in this room is so evenly distributed that the special directional troffer light in the ceiling parallel to the chalkboard was found to be unnecessary. The chalkboard is perfectly visible throughout the room with only the general illumination, and no condition of glare exists.

Incidentally, the fact that even the furniture has a dull oil finish without any stain, rather than the more conventional glossy varnish or lacquer, illustrates the importance placed by lighting engineers upon glare, over and above any psychological or aesthetic considerations. The vertical louvers at the windows in front of light diffusing shades were used as a further means of eliminating glare. The shades are used only to exclude direct sunlight and would be unnecessary on north windows. This method of daylight control has proven to be most effectual. South American countries have used the vertical louver for some time, and its use in classrooms is certainly practical when considering the chalk dust that is bound to settle upon horizontal slats.

How and Where to Use Chalkboard

The location and quantities of chalkboards are now being established more upon the basis of teaching techniques and subjects taught rather than by the old rule of thumb: across the front and sidewalls and kept 4 feet from a window opening. While it seems improbable that there would ever be a need of placing a chalkboard on a windowed wall, even this is possible with proper daylight control and adequate artificial illumination. From the blackboard's inauguration at Bowdoin in 1817 to date, the teaching of mathematics seems to have consistently favored large areas of



Decorative use of chalkboard. This illustration shows chalkboard can be more than just a necessary aesthetic evil. Too much unnecessary color contrast in this room, however, tends to produce glare

chalkboard. On the other hand, social subjects have tended toward less chalkboard and more bulletin space.

In passing, the problem of glare should also be studied when choosing bulletin board colors. The ever popular corkboard comes in several shades. In the experimental schoolroom previously mentioned, as corkboard was unavailable, a composition board was resorted to and, to avoid the unsightliness of thumbtack holes, was covered with a coarse cloth of a light neutral color. This has proved to be so successful that it might be suggested as a note of variety in texture and color for the bulletin board of the future. The common practice of placing a narrow band of bulletin board over the chalkboard seems to have good application only for pictorial mountings of simple scale. The excessive height from the eye would render any written work ineffectual as an exhibit. For this reason a blanket use of this bulletin strip is not practical.

The height of mounting chalkboards should be governed by function. Accepted floor to chalkrail heights have been established as follows:

Primary	24″
Elementary	26″—28″
Junior High	30″—36″
Senior High and College	32″—38″

It appears unlikely that the top of a chalkboard would ever need to exceed 7 feet from the floor unless for some unusual reason. The more usual height is 6½ feet.

As an example of a decorative use of a chalkboard the accompanying illustration shows a circular board, 6 feet in diameter, in an art room having an arched ceiling to reflect the light from the north windows. The top of the board is just under 9 feet from the floor, and it is conceivable that it might at times be filled by a large scale drawing, but obviously a stand would be necessary for reaching the top. The color in this case contrasts darkly with the walls. The board is incidental, rather than all-over in character, though it could be just as effective in a light color.

In the past, the decorative use of chalkboards has been largely ignored. Now that applied ornament is no longer acceptable, modern design should concentrate on beautifying the necessary elements of a room. Well-studied line and proportion have intrinsic beauty.

Can Chalk Dust Be Overcome?

Chalkboards of the future are a conundrum. You will notice from this brief history that changes and improvements of the past have been occurring as a diminishing geometric progression of time intervals. Already audio-visual equipment is replacing in part, or supplementing, the chalkboard. However, until some device is developed which retains its flexibility, the chalkboard will undoubtedly remain with us. And

since it is now possible to obtain it in light colors, one might perhaps ask why not?

There is one fundamental drawback to all chalkboards, the chalk dust. It is difficult to estimate the cumulative nuisance and expense occasioned by this one item. First and foremost, it adds considerably to the cleaning costs of schoolrooms. It settles upon lighting fixtures, cutting down their efficiency, upon books and desks and any projecting surfaces, upon hands and clothing, and finally is breathed into the respiratory systems of teachers and pupils. Industry spends fabulous amounts for dust control, whereas, with the exception of occasional air washers and filters in recirculating systems, the dust nuisance of chalkboards is practically uncontrolled. The so-called "dustless chalk" is only relatively so, and it costs twice as much as ordinary chalk.

There has been some criticism by teachers that the dark chalk used on light boards leaves clothing excessively dusty. I am confident that it is no dustier than white chalk, but that it shows up on hands and clothing to a greater disadvantage. This evil might be somewhat overcome if the chalk manufacturers could be persuaded to cover chalk with paper jackets similar to those on wax crayons, or if metal or plastic chalk holders were used like those available for charcoal. Incidentally, charcoal has also been used satisfactorily on light chalkboards. However, all these devices are merely keeping dust from the hands of the user. The chalk will still dust off into the room.

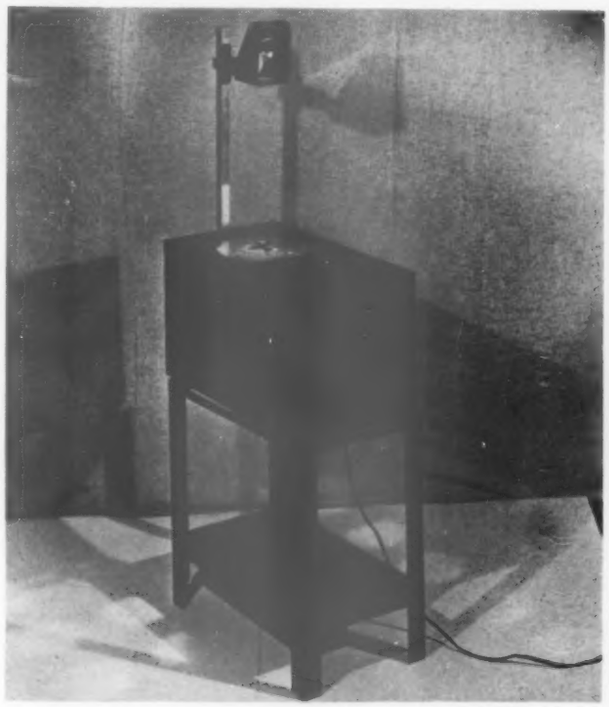
Perhaps a crayon may be developed with a wax binder for which there is an inexpensive, odorless, and non-toxic solvent. It is not unreasonable to suppose that it might then replace chalk and eliminate the dust nuisance. It also seems possible that for the writing surface a plastic sheet material with unlimited integral color possibilities might be developed. China marking crayon can be rubbed off easily with a dry cloth from a smooth non-porous surface. Unfortunately, such a smooth surface is likely to be shiny and productive of glare.

When the paper manufacturers have once again caught up with the current demand for their products they might develop an expendable surface of inexpensive tinted paper, either in large sheet form or in rolls which could be reversed to make possible use of both sides. Thus, wax crayons might be used without need for erasures. Undoubtedly there would be resistance to this idea because of the operational cost, but paper has already replaced individual slates in spite of the same criticism.

Grease Pencil Projection

At a lecture last winter, a projection machine was used that enabled the speaker to face the audience while making grease pencil illustrations that projected on a screen behind him. The grease pencil line was drawn on a 7½ inch diameter clear plastic sheet in the horizontal plane, the image of which was enlarged to a circle of 6 feet diameter on a wall screen 12 feet at the speaker's rear.

This visual aid can be used in a normally lighted room if the screen is relatively close to the projector, as it would be in the average classroom if projected on the wall behind the teacher. For erasing the grease pencil line, a small dry soft cloth was used without any solvent. Not only can this be used as a lecture "chalkboard" without requiring the instructor to leave his seat or turn away from the class, but drawings, photographs, charts, etc., when reproduced as transparencies, can also be projected. If the instructor wishes to animate the picture he can draw a line apparently on it, but actually on a transparent plate covering it, without effecting the original, or he can point to any detail with a pencil and have the pointer immediately projected upon the screen as a silhouette. In drawing or writing on the plate, the



Visual aid projector used in the navy training schools

instructor works in a normal fashion, not upside down or mirror-wise. With an attached accessory, the device can also be used for projecting slides.

This projection device appears to be a development of naval war research; it is just a matter of time until it will become available for public use. As in all cases, the cost will probably be high until it gets into mass production. While it may never replace the chalkboard, as it does not allow for individual pupil work, it is an indication of the trend of times and new possibilities.

Non-Stain "Wallpaper"

Plastics manufacturers are now advertising a new non-stain absorbing "wallpaper." Perhaps at some future time this might be applied to schoolroom walls as an all-over surfacing material which can be written on with pencil or crayon at any point and merely rubbed off with a damp cloth. Certainly this would represent the ultimate in cleanliness and flexibility.

Specifications for "Perfect" Chalkboard

None of these suggestions appears to be the perfect solution. If one were to write an outline perform-



Visual aid projector in use. Although the classroom is darkened in this case, the image is sharp enough to be used in a room normally lighted, making it possible to take down notes with ease

ance specification for the perfect "chalkboard," or its equivalent, it might well be:

A device which is:

1. Silent to operate.
2. Flexible in use and location.
3. Long lived.
4. Inexpensive in initial and operational costs.
5. Free of dust and odor.
6. Low in light absorption.
7. Free from glare.

All these features have been incorporated singly and in groups in various devices but never entirely in one. Perhaps, with technological advances rapidly unfolding, we may hope for the solution to all seven demands in the near future in a single device.

We are living in an age when science is moving so rapidly that there is real danger of a social upheaval. According to one of the country's leading scientists, many discoveries have actually been held in abeyance until their economic impact can be controlled. However, in spite of this research, there has been relatively little change in chalkboard characteristics over a period of seven hundred years. In this field technology should be given every opportunity to advance, and we as architects, engineers, and educators should encourage it.

PLANNING THE SCHOOL SOUND SYSTEM

By MAX U. BILDERSEE

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TWENTY years ago few if any schools were equipped for the presentation of audio stimuli to learning. Yet within a generation the importance of the listening exercise as part of the learning situation has been recognized until today in most schools being built, consideration will be given to the problems of sound amplification, transmission, and reproduction for individual and group listening. This fact alone is ample evidence that educators recognize their responsibility to help students learn to listen intelligently, to appraise the spoken word accurately, in short to listen critically and objectively. Schoolmen know that they are obligated to help the student develop good listening habits and exercise discrimination in the selection of materials to be heard.

The first step in providing for an audio program is to determine both the immediate and the long range objectives to be achieved. These must be studied and appraised for their relative importance before the program concerned with their realization can be considered.

Second in providing audio equipment for any school is the establishment of a workable program of audio education through which each student will have an opportunity to learn to listen intelligently. All too often the reverse procedure is followed, and the school program must be developed around already installed equipment.

Then the audio education budget must be known so that poorly chosen partial equipment purchases do not stifle the steady development of the sound program. Finally, the administrator or other person responsible for procuring the equipment, should study all availabilities so that the most economical purchases will be made. As it is not always true that the cheapest equipment is the most economical, the experience of other educators, the reputation of the manufacturer, the advice of experts, and the flexibility of the equipment should be considered.

Uses of Audio Equipment

Audio materials and experiences will contribute to intellectual growth in each study area. At the present time, certain fields offer greater opportunities for the use of audio devices in learning situations than others.

The conscientious language teacher who wishes to make all the learning tools available to her students will find more than occasional use for the radio, the record and transcription player, and the recorder. Only through proper utilization of all the audio tools can the teacher help students realize a full measure of aural comprehension—speaking and hearing—a foreign language.

A similar situation is presented when the field of English, including literature, composition, speech, and grammar, is analyzed. Certainly the literature of the language is meant to be heard as well as to be read. The rendition of both poetry and prose by the trained person will bring with it an appreciation and an understanding that the student otherwise will fail to achieve. Poetry, read by the author in some cases, by the accomplished reader in others, is available in recorded form and can be used in classes to motivate a desire to learn, to present information in a highly polished manner, and to summarize material with which the student is already acquainted. In drama, particularly in the Shakespearian plays, the student may be inspired by the reading of Maurice Evans, of Orson Welles, or of the late John Barrymore.

The audio tools present their challenge, too, in the field of composition. Writing to be heard presents problems different from those the student faces when he writes to be read. The conscientious speech teacher must bring the student face-to-face with the microphone and the attendant equipment of amplification.

Thus, aside from corrective teaching, the audio tools have meaning in the teaching of English. And, in the field of speech correction, the student should be given the opportunity through recordings to hear and to recognize his own errors, to effect his own changes, and to measure his own progress toward better speech and a more adequate vocabulary.

In the social studies the record, the radio, and the recorder play important parts in the learning situation. Through recorded sound the alert teacher is able to present quotations of historical importance as they were originally spoken. The projection of personalities, both past and present, into the learning situation gives the student a vicarious experience which contributes in large measure to the progress of learning.

In the areas of science and health equal contributions can be made. In commercial subjects the use of the disembodied voice is helpful. Salesmanship training students should hear sales presentations that are more than merely good, and they should have the opportunity through school-made records of hearing, appraising, and improving their own techniques.

The contributions of sound equipment to the field of music seem obvious. Yet surprisingly little use of the recorder is being made compared with the services it can render in the fields of group and solo singing, of individual and ensemble instrumental performances.

Last, the sound equipment can contribute to the administration of the school. Regular school announcements can be prepared by students and presented over existing public address equipment. School "newscasts" dealing with international, national, local and school news can become integral episodes in the daily routine.

A service for occasional use—only in the presence

of a real emergency—is the issuance of instructions or announcements from the principal's office. It cannot be emphasized too strongly that this is a minor function of the central sound system. A ready tool at the administrator's hand, it must be used sparingly, reserved for those special occasions when other avenues of communication will not suffice.

Buying Sound Equipment

An audio program such as the one sketchily outlined will need a variety of equipment. No single device can meet all the needs indicated, and much portable equipment will be useful in extending the range and variety of audio experiences offered the students as well as in simplifying the administration of the equipment from every standpoint.

In many schools the sound equipment as a whole is built around and is intended to implement the use of a major unit such as a central sound system. Thus, this one multi-purpose unit becomes the fixed piece of apparatus and all other units, being subordinate to it and intended for use by smaller groups, are portable.

If it is determined that the main unit shall be a school audio sound system, the features of each product should be weighed for quality. Each such piece of equipment should contain radio tuners which are capable of detecting broadcast signals from "standard" or Amplitude Modulation broadcast stations. Provisions should also be made for receiving signals from the newer "staticless" or Frequency Modulation stations. In units of best quality these functions will probably be separate.

The equipment should include amplifiers of high quality capable of amplifying the signal received without noticeable distortion. There should be a sufficient number of amplifiers to serve all the purposes that the system may be called upon to perform at any one time.

The loudspeakers should be of such type as to reproduce the full signal delivered by the amplifiers, without distortion, and covering an appreciably wide audio range. The ear can be fooled in this respect and, consequently, is not a sufficient judge. Before any decision is made, laboratory reports on the performance of each component should be consulted.

The central sound system should include a dual speed turntable which can be operated at either 78 revolutions per minute or 33⅓ revolutions per minute at the operator's discretion. It is useless to have dual speed if the machine is so built that it will not accommodate a sixteen inch (diameter) disc.

Other auxiliary equipment such as microphones, pick-up arm, and antennae will be included. Each unit should be searchingly examined to be sure that it is of high quality.

The talk-back feature incorporated into some sound systems installed in the years just preceding the war was an unfortunate attempt to combine the functions of two different instruments and, as is usual in such cases, it rendered entirely inadequate service in both fields. With this device the teacher may reply to a communication from the central sound station, but cannot originate the conversation. It is an extremely poor substitute for adequate intra-mural telephone equipment. The tone of the sound reproduced will probably be less realistic than in installations of which

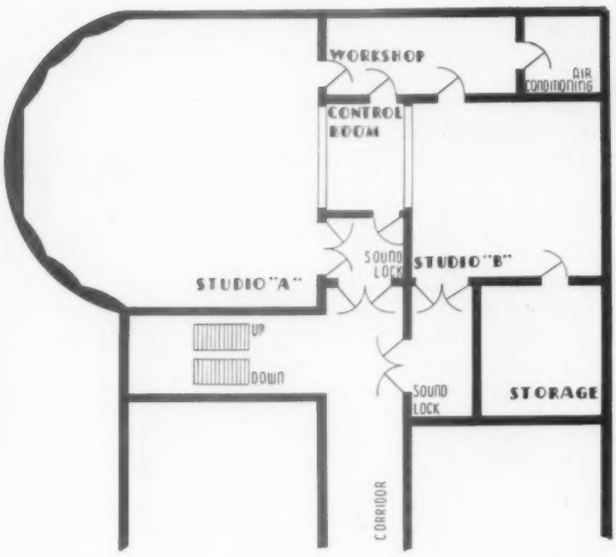


Audio tools have many applications in learning situations in our schools

Courtesy of U. S. Office of Education



Pupil broadcasting from a school station. The development of radio has made possible many new experiences for students



Plan for sound studio suite. Locating sound system in independent quarters facilitates use by many groups and persons

this device is not a part. A further detriment is the suspicion on the part of the teacher that it may be used for eavesdropping, featuring supervision of the most objectionable type.

By and large, sound equipment will not deliver more than is called for in the manufacturer's specifications. These are highly technical and should be studied by a disinterested expert before any contracts are signed.

The sound equipment is an important single item by itself and, in purchase, should not be lumped with clocks, other electrical equipment, science apparatus, or any other part of the school purchase program.

Installing Sound Equipment

The permanent value of the equipment to the school as a whole may depend upon its location within the building. It is generally agreed by schoolmen using such equipment that installation in the principal's office seriously inhibits and in some cases prohibits a full measure of student participation in the school's audio program. Establishment in the general office or in the administrator's office may make of a learning tool a gadget used for trivial administrative purposes.

Modern educational practices demand that the sound system be located in an entirely independent room or suite of rooms. The needs of many classes and individuals for the equipment indicates the probable immediate development of a studio-control room or of an audio apartment as part of the plans for new buildings and as part of the redesigning of schools already in use. Unless such rooms are properly sound conditioned, the full potentialities of the sound equipment cannot be realized.

It is probable that the school program will call for audio equipment utilization by more than one group of students at a single time, and allowances must be made for these needs. This can be accomplished by dual studio set-ups calling for a larger room to accommodate large groups and a more intimate room for speakers and for dramatic rehearsals and presentations. In addition, it will probably be desirable to install so-called "remote" or microphone lines to such special purpose rooms as the speech room, the music room, the English room, the foreign language section, the gymnasium, the cafeteria, the auditorium, the auditorium stage and other points, including the center of administration.

To supplement the central installation, diversified portable equipment to serve particular needs is required. Dual speed turntables with independent amplifiers and loudspeakers will be needed. So, too, will recorders be important. It may prove wise to install permanently in the control room one or more such machines and to have additional machines available for special purposes. These may be of the disc type, or of the somewhat newer tape or wire types. The uses to which the equipment is to be put should determine the nature of the installation.

Individual classrooms should be sound conditioned for the best hearing potentialities. This cannot be done merely by plastering with acoustic plaster or by supplying sound absorbent material without careful study. Sound conditioning every part of the school

need not be overly expensive but should be planned and supervised by individuals specially trained in this comparatively new field.

Properly equipping the library, which assumes and serves definite functions in this developing program, is extremely important. Facilities must be provided for storing certain records so that they are as available as books and can be used for reference sources of importance and of documentary value. Individual audition needs must be met as surely as similar provisions are made for reading needs. Thus the audio exercise becomes part of both assigned and classroom work with the necessary materials readily available to the students and teachers in a central place.

Because sound equipment is only as good as the weakest link in the whole, the purchaser must establish a high minimum standard of quality which should be met not only by each component but by the overall performance as well. This cannot be assured unless the person undertaking the installation is responsible and capable. The installation contract should be a unit by itself, and every detail should be fully covered in contractual agreements.

Place and Importance of Sound

The audio program as a whole is but a part of the learning situation and must be integrated with the whole school program. It functions by making learning more rapid and more attractive. There can be no doubt of its value and importance.

Because the true beginning of learning is the interplay of personality between teacher and student, each tool used must be considered supplemental. Each must play its integral part in the training of young people if they are to gain knowledge and to develop the skills of living.

Adults devote many more hours each day to listening than to reading. Radio is probably the most powerful single social force in the world today, and its potential influence cannot be estimated, because children are developing habits of regular listening.

Careful and intensive training in listening is apparently needed. Through school activities, students must develop standards for appraising audio experiences. Just as children develop attitudes of intelligent reading, so they must develop habits of careful and intelligent listening.

The wide demand for popular education can be traced to the development of printing from movable type, an achievement of imagination and invention which forced an educational evolution. It is not inconceivable that the development of radio presages a new educational evolution which will remove the barriers to truly equal educational opportunity; finally making education—even formal education—a continuing process for all.

BALANCED BRIGHTNESS VS. FOOTCANDLE INTENSITIES AS RELATED TO CLASSROOM LIGHTING

By CHARLES D. GIBSON

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THE story of lighting has been told so long in terms of footcandle intensities, we are afraid people will soon begin to believe it. Those of us interested in good visual environments for schools have been bombasted for years with the idea that if we had 5, 10, 15, 20, 30, or 100 footcandles of light on the desk tops in our classrooms, we then had a good lighting job—but "it ain't necessarily so!"

How Much Light vs. How Well Can We See

School lighting codes have placed their great emphasis on tables showing how many footcandles are needed for visual tasks in classrooms, shops, libraries, sight-saving rooms, and all the other spaces used for instructional purposes. We all have run about with a footcandle meter in one hand, and a pencil in the other, recording how much light was falling here and there. If what was found measured up to what our "code tables" said was an adequate intensity, we blessed ourselves, benignly believing we had done right by our responsibility to provide an acceptable visual environment for the students under our jurisdiction . . . *but had we?*

The theme of this article is one of the changing emphasis in the lighting field. This change consists of switching emphasis from the consideration of *how much light* to the wider concern of *how well can we see?* The thinking of informed illuminating engineers has advanced well past the limited concept that quantities of light make a good lighting job, to a broader, and certainly more defensible, concept that an adequate visual environment can be created only by the application of the multisided factor of brightness to any given space.

The other change of emphasis we wish to discuss is the need for the abandonment of fixed-intensity standards, specific methods of lighting, and preferred light sources in favor of a true understanding of the principles involved in the creation of an adequate visual environment and the evaluation of lighting adequacy against those principles.

What We Want

What we want for school spaces is a visual environment that makes seeing comfortable, easy, and fast. We want to make seeing a process that uses up a minimum rather than a maximum of human resources. We want our schoolrooms to contribute to eye and body *health* rather than to eye and body *defects*. We can never satisfy these wants if we continue to use the methods that have marked our past feeble efforts. We can reach our goals only if we learn to apply intelligently the very simple principles that will enable us to create schoolroom environments that make possible for the students and teachers a maximum of visual accuracy and comfort while they expend a minimum of effort and energy.

Vocabulary

One of the main reasons the lay public has remained confused about the real part light plays in the visual process is that they haven't understood the meaning of lighting terminology. There can be no understanding about the fundamentals of the relationship of light and seeing until the basic verbiage is clarified. Out of the hundreds of technical terms used in the lighting field, we need to understand only about six to gain a fundamental knowledge of what it takes to create a good seeing environment. Here they are:

Footcandle (FC) · This is the most overworked and overrated of all the lighting terms. The technical definition of a footcandle is as follows:

> The footcandle is the illumination produced at a surface, all points of which are at a distance of one foot from a uniform point source of one candle.

What all that means to you and to me is that the footcandle is the "unit" of "light intensity." The quantity of light falling upon a given surface is meas-

ured in terms of numbers of footcandles. The footcandle erroneously has been elevated to its exalted position in the lighting world simply because it is easy to measure. The footcandle meter used to measure the quantity of light is the only instrument related to the measurement of light that can be read objectively by the lay person. The footcandle is a very important and basic factor, but it must be evaluated only in its relationships with other basic factors if we are to weight it properly in the lighting field.

Reflection Factor (RF). In the field of critical seeing, "reflection factor" is as basic to a good visual environment as are footcandles. One certainly never would suspect this fact if he read and listened only to the 50-100 footcandle story. True, the place of reflection factor in the lighting story is told in a subheaded paragraph or two while *chapters* are devoted to the fallacious footcandle.

The technical definition of "reflection factor" is as follows:

> The reflection factor of a body is the ratio of the light reflected by the body to the incident light.

This is the way it works. Light, in terms of footcandle intensity, falls upon a surface. The surface absorbs a portion of the light falling upon it and reflects the remainder. The percentage of the total amount of light falling upon the surface which is reflected by the surface, is its "reflection factor." For example, assuming an equal number of footcandles fall on all parts of this page, we find that the white paper reflects about 80% of the light falling upon it, giving it a reflection factor of 80%, while the black type reflects about 3% of the incident light, giving the black a reflection factor of 3%.

Footlambert (FL): The footlambert has taken over the key spot in lighting terminology, and it's about time. The technical definition of a footlambert is as follows:

> The footlambert is a unit of brightness equal to the uniform brightness of a perfectly diffusing surface emitting or reflecting light at the rate of one lumen per square foot.

Again, bringing science to curb-level, the footlambert is a "unit of brightness." The average brightness of any reflecting surface in footlamberts is the product of the illumination in footcandles by the reflection factor of the surface. Thus we see that the term "footlambert" is a much broader and certainly a more significant factor than either the footcandle or reflection factor, since it is the product of their "times-ing" one another.

Brightness: Brightness in terms of footlamberts has been explained in preceding paragraphs. There is one other common unit of brightness which we will mention because it is the unit by which we measure the brightness of any given light source. This second unit of brightness is called "candles per square inch."

The "footlambert" is used to measure the brightness of reflecting surfaces while the unit "candles per square inch" is used to measure the brightness of light sources. It is becoming common practice in the lighting field to translate as much "brightness" talk as possible into units of footlamberts. This transition in terminology is simple to make since "1 candle per square inch" equals 452 footlamberts. Simplifying the terms by using the "footlambert" as the common unit for expressing brightness will help make this most important factor better understood both among lighting specialists and the lay public.

Visual Fields

Any visual environment is made up of visual fields. These "fields" are areas or cones of varying size centering along the optical axis. The brightness-differences that are maintained within these visual fields will determine to a major degree how comfortably, how easily, and how quickly, we see. If you recall the first part of this article, you will remember that comfort, ease, and speed of vision are what we said we wanted in school teaching spaces. Luckiesh * in his masterful way has developed the story of the visual fields and the great significance of the distribution of brightness within these fields. He arbitrarily has delimited these fields, since the physiognomy of each individual (eyebrows, nose, and cheekbones), and other factors, serve to vary the angular extent of these areas.

The "focal field" lies at the center of the total visual field, directly on the line of sight. It is approximately one degree in extent and corresponds to the foveal area of the retina. It is in this small one-degree field that we do all our seeing of fine details.

The "central field" varies in extent with the visual task. For the sake of simplicity and as meaningful in this article, it might well be considered the same in area as the visual task.

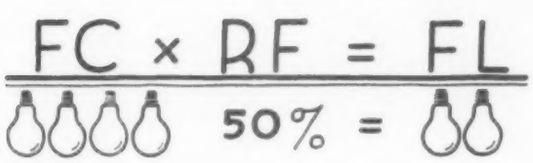
The "surrounding field" has been delimited by Luckiesh as covering about 60 degrees of the central part of the total visual field. Thus, this field would extend approximately 30 degrees on each side of the line of sight.

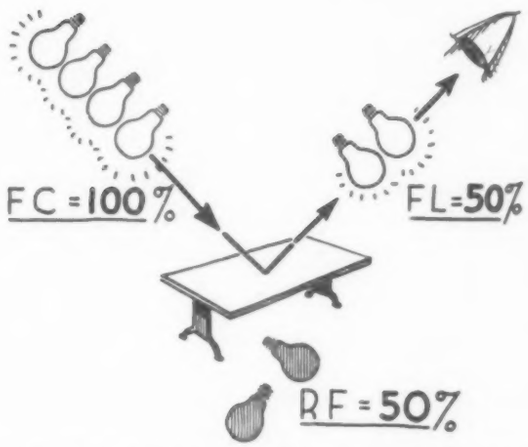
The "peripheral field" may be defined for our purposes as the remainder of the total visual field (120 degrees vertically, and 160 degrees horizontally) lying outside the surrounding field.

Brightness-Difference Principles

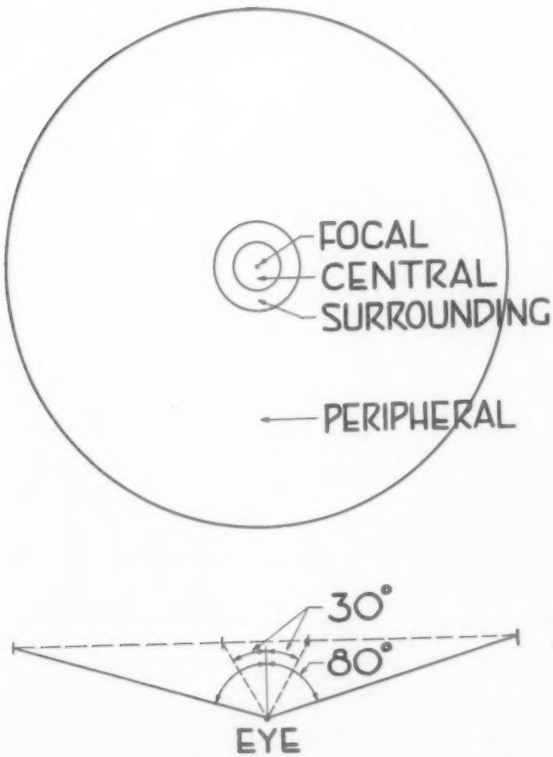
We can state the principle of ideal brightness-difference for these visual fields in the following very simple, but none-the-less accurate, way: The brightness-differences within the focal and central fields should be as great as possible while the brightness-differences between the visual task (central field) and the brightnesses found in the surrounding and peripheral fields should be as little as possible. In other words, in the task itself we want *high* brightness-differences, and *beyond* the area covered by the visual task, we want *low* brightness-differences. When we are able to work toward ideal brightness-differences in the several visual fields, we set up the following brightness goals: In the focal and central fields we would maintain the maximum possible brightness-differences. In the surrounding and peripheral fields, we would strive to maintain brightnesses which would be as near as possible to the brightness of the task itself. However, under most circumstances, this is not economically feasible. A practical "ideal" goal would allow a maximum brightness-difference of 10 to 1 between the brightest and the darkest objects in the surrounding and peripheral fields. If the story of

* Matthew Luckiesh. *Light, Vision and Seeing.* New York City: D. Van Nostrand Co., 1944. 323 P.





The footlambert is a product of the footcandle times the reflection factor . . . The chart is self-explanatory, but it would be more effective if it were possible to grade down, for pochade, the table top, to indicate a darker surface which would absorb approximately 50% of the light. Visual fields are illustrated in the chart below



"The 'focal field' lies at the center of the total visual field, directly on the line of sight"

seeing were to be told in a nutshell, it might well be said this way—brightness-differences in the total visual environment determine how well we see.

Typical Brightnesses in a Classroom Environment

The tabulations shown are average values for some of the many sources of brightness-differences which

	FOOT LAMBERTS
CLEAR SKY	1,000
HAZY SKY	2,000
WHITE CLOUDS	3-5,000
SUNLIGHT ON WHITE BUILDING	8,000
SUNLIGHT ON TREES	320
BARE 200 WATT LAMP	65,000
ENCLOSING GLOBE	1,200
FLUORESCENT LAMPS (48")	
AT 90° ANGLE TO AXIS	2,100
AT 30° ANGLE TO AXIS	1,600
IN U.R.C. FIXTURES	500
WHITE CEILINGS OVER INDIRECT FIXTURES	
500 W HUNG 30"	75
500 W HUNG 48"	45
750 W HUNG 48"	65
750 W HUNG 60"	52
1,000 W HUNG 48"	90
1,000 W HUNG 60"	70
BLACKBOARD WITH 25 F.C.	2.5

Illustrations of brightness

are to be found in the classroom. Many actual brightness readings will vary widely from those shown because of the particular condition under which the source is viewed. For example, the sky and cloud readings would depend largely upon the location of the sun as related to the area under consideration. A so-called "hazy sky" might easily have a brightness exceeding 20,000 footlamberts if the area under consideration was in line with, or next to, the sun. At the same time, the same sky when viewed to the north might be less than the 2,000 footlamberts shown in the table. The brightness of clouds is dependent upon the intensity of the sunlight and the density of the clouds, and in many cases will be as high as 8,000 footlamberts. The brightness shown for an enclosing globe is somewhat higher than that normally specified for this type of fixture; however, even when equipped with lamps of the wattage specified for the particular glassware, many of these units exceed the brightness shown. Bare fluorescent lamps should never be recommended for use in installations under which critical seeing is done; however, this value is given purely for purposes of comparison. Because of the fact that most of the light from a fluorescent lamp is given off at right angles to the axis of the lamp, it appears somewhat less glaring when viewed from an angle. This is illustrated by the brightness-readings taken at 90° to

the axis and at 30° to the axis. The fixture, designated as the "URC," is a type manufactured by several companies and is required to meet the specifications of the Utilities Research Commission from which the fixture derives its name. This unit uses four 48″ fluorescent lamps which are shielded from view by glass panels on the bottom and sides. The angle of viewing also alters the brightness of this fixture, but the figure shown is the maximum allowable.

The brightness of a white ceiling over indirect fixtures will vary considerably depending upon the distribution characteristics of the reflector used, the distance from the ceiling, and the wattage of the lamp. Some indirect fixtures concentrate most of the light directly over the fixture, with the result that the ceiling is bright over the fixture and dark between fixtures. On the other hand, a well-designed unit directs the light over a larger area, and this results in a more evenly-lighted ceiling, thereby eliminating the wide variation in brightness as well as materially reducing the intensity of the highest brightness. The values given in the table are for well-designed units of high over-all efficiency.

There have been many methods suggested for evaluating the effect of glare sources upon the visual environment, and although the methods are different, there are several factors which are basic in all considerations. The factors most generally accepted are the brightness of the glare source, its apparent area, the angle of viewing, and the surrounding brightnesses.

Where all other factors remain constant, a brightness source is rated in direct proportion to its apparent area. For example, a glass-enclosed globe with a brightness of 1200 footlamberts and an apparent area of one square foot is only one-fourth as bothersome as an area of four square feet which has the same brightness. For this reason, systems using fixtures of a relatively large area or large reflecting surfaces must have low maximum brightness to maintain comfort.

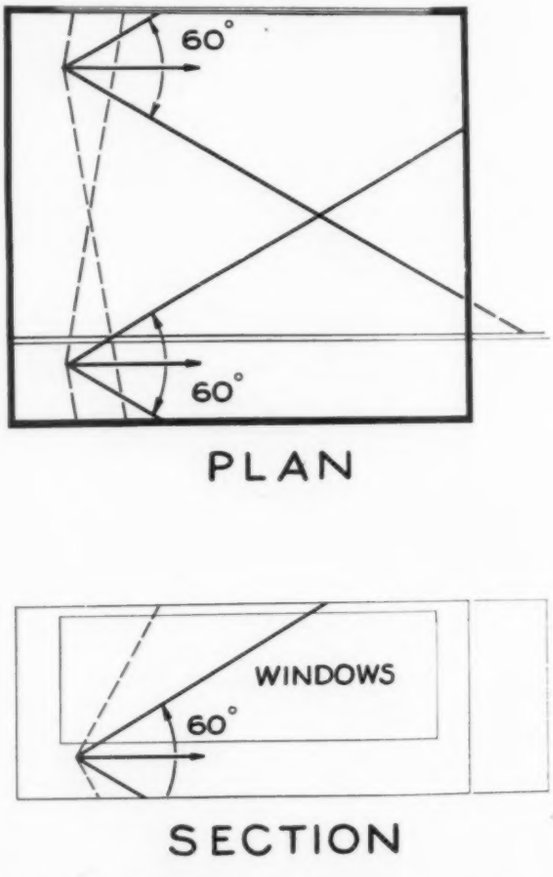
Sources of brightness which are either high or low as compared with the brightness in the central field are more and more annoying as they approach the normal line of sight. A glare source near the line of vision may prove extremely annoying, whereas the same source may be entirely unnoticed when located far to one side or above the line of vision. The last and extremely important factor in our consideration of glare ratings is that of the brightness of the area surrounding the glare source. The flame of a cigarette lighter at night will blot out all detail in its surroundings, whereas the same flame in daylight would hardly be noticed. For the same reason, a bright light source against a dark background will be beyond tolerance, and yet the same fixture, when viewed against a well-lighted ceiling may prove perfectly comfortable.

The conclusions drawn from most discussions on glare and the balancing of sources of bright-differences are basically as follows:

(a) Brightness levels throughout the seeing environment should be kept as nearly as possible to the same value.
(b) Areas of either high or low brightness should be kept to the smallest area practicable.
(c) Areas of either high or low brightness should be kept as far from the line of sight as possible if they cannot be eliminated or corrected.

Application of Brightness Principles

The various sources of brightness-differences as viewed from the rear of a classroom include: windows, lighting fixtures, ceilings, walls, furniture, floors, and many other secondary sources of brightness-differences. If we are to maintain any degree of balance



Visual fields in a classroom. In either the "square-type" or rectangular classroom, it is obvious that the students at the rear of the room are exposed to the full range of brightness-differences, from the maximum brightness of the sky to the minimum brightness of the darkest areas in the classroom

in the compromise for comfortable conditions, we must start by reducing the differences between the extreme conditions, lightening the dark areas, and reducing brightness of bright sources. Dark-colored desk tops and floors are in the direct line of sight for all work done on the desk, and inasmuch as most of the work is either reading or writing on white paper, these areas surrounding the work should be nearly the same brightness as the paper. Desk tops of bleached wood and floors of many different and proven materials are available in reflection factors of 30% or higher. Colors and materials in this general range of reflection factor would produce a brightness-difference of only 3 or 4 to 1, which is well within the limits for comfort.

The conventional blackboard is another large area

of low brightness found in the classroom. We would rather call this the "writing panel" or "chalkboard" and make its color of as high a reflection factor as possible while still retaining the ability to comfortably and accurately read the symbols written in white chalk. We realize that by increasing the reflection factor of the writing panel we reduce the contrast between the panel and the white chalk. This reduction in contrast and the resultant reduction in relative visibility would be a detriment if it were not for the fact that we must increase the general level of intensity within the room to balance other factors. This increased intensity on the chalkboard will more than offset the loss due to reduced contrast.

The sky, clouds, and sunlit buildings as seen through the classroom windows are the sources of maximum brightness in the seeing environment. Many and varied attempts have been made to reduce the brightness and yet obtain the maximum of useful light from the essential window areas. The ultimate satisfactory solution must provide sufficient glass area to develop the maximum practical illumination and the glass area must be shielded in order to obtain a tolerable brightness. Many seeing specialists who have worked with the problem of shielding have come to the conclusion that the teacher cannot be expected or depended upon to efficiently control and adjust any shielding device. She is already overloaded with the details of planning and teaching a large school program. For this reason, the solution to the problem of shielding will be in some permanently fixed system for efficient utilization and brightness reduction.

In order to maintain the desirable balance of brightness within the classroom, we are faced with a seemingly difficult problem of increasing the intensity of light and consequently the brightness within the classroom, and at the same time reducing the brightness of windows by some form of fixed shielding. There are several methods of increasing the interior intensities with natural light in new projects; however, the only solution for existing rooms is through the intelligent use of paint and artificial light.

In the following example, we will attempt to illustrate the several things which can be done to make a typical poorly conditioned room a more nearly ideal seeing environment. The typical existing conditions might be as follows:

1. Maximum brightness through windows: 3000 footlamberts.
2. Maximum intensity in classroom: 150 footcandles next to window.
3. Brightness on chalkboard: 1.5 footlamberts as the result of 15 footcandles on 10% reflection factor board.
4. Minimum intensity in classroom: 5 footcandles of natural light and 10 footcandles when lights are on.
5. Minimum brightness on desk top: 10% reflection factor under 10 footcandles is 1 footlambert.
6. Reflection factor of ceiling: 60%.
7. Reflection factor of walls: 45%.
8. Reflection factor of floors and desk tops: 10%.

The maximum brightness-difference in this room is seen to be 3000 to 1 between sky and desk top and floor; and 2000 to 1 between sky and chalkboard. By increasing the reflection factor of the floor and desk tops from 10% to 30% with no change in the intensity on the desks, it is possible to reduce the maximum brightness-difference to 1000 to 1. If we install a lighting system to produce 30 footcandles instead of 10, the brightness of the floor and desk tops becomes 9 footlamberts and the brightness-difference is 333 to 1. Under the new lighting system, the chalkboard may have 45 to 50 footcandles and with a new writing panel of 30% reflection factor the brightness is 10.5 footlamberts. Now, by reducing the sky brightness with window-shielding to approximately 300 footlamberts, the maximum brightness-difference is only 33 to 1.

It is obvious now that the maximum brightness-difference is a compromise between the density of the window-shielding and the intensity of interior illumination, either natural or artificial. As higher levels of illumination are achieved, it will be possible to increase window-shield brightness with no sacrifice of comfort, or it will be possible to leave the low-brightness window shielding and *improve* the seeing environment. Under any circumstances, if any reasonable balance between window brightness and the interior is achieved, it will be necessary to install either artificial or natural lighting installations which produce intensities several times that which have currently been considered as minimum allowable intensities.

This is not, of course, the end of the work to be done, for we have yet to paint the ceilings and sidewalls to better utilize the natural and artificial light. At this time if there are dark wood mouldings, they should be painted to match or nearly match the wall, thereby eliminating narrow bands of strong contrast which are distracting sources of brightness-difference.

The maintenance of brightness balance does not mean that we are limited to the use of any one color in classroom decoration. Any color can be lightened or darkened to make it suitable for the surface to be decorated. The selection of the color is an extremely important phase in the development of comfortable and cheerful surroundings.

The study of color is a large subject in itself and does not fall within the scope of this article except as it affects the balance of brightness.

The lighting system must be designed on the basis of producing uniformly-distributed illumination of the best shadow-free quality, eliminating high-fixture brightness, reducing to a minimum the contrast between the ceiling and fixture, and eliminating the reflected glare of lamps or fixtures mirrored in the desk tops or on glossy paper.

Conclusions

1. The selection of a lighting system is a compromise between efficiency in terms of the utilization of raw light in the production of footcandles and efficiency in terms of the development of a comfortable seeing environment. The footcandle as a measure of lighting adequacy has been vastly overrated. A high intensity of light at desk top level does not necessarily mean that you can see comfortably or well in a classroom. We must begin to think about lighting from the viewpoint of *how well can we see,* rather than *how much light do we have.*

2. The seeing environment can be improved at least 100% in the average classroom without buying one new light fixture, and without adding one watt to the electric load. However, in our fervor to better utilize both daylight and artificial light by the use of high reflection-factor surfaces, we should remember that color, also, has psychological and emotional values for people. Reflection factor must compromise at times with warmth, coolness, and cheerfulness.

3. Beware of lighting codes, recommendations, or standards of any kind that try to tell the story of adequate lighting in terms of narrow emphasis on footcandle intensities and/or which endeavor to "sell" any one light source as the answer to lighting problems. Light sources have changed and will continue to change. Fixture design is one of the most variable and fast-changing phases of the lighting industry. The *principles* for creating a good environment for comfortable, easy, and fast seeing, however, have remained the same since light and the eye first became partners in the visual process. Evaluate your lighting systems against these principles, for the school lighting dollar must serve boys, girls, and adults far past the fad of the moment.

AUTHORS' NOTE: The "technical definitions" used in this article were taken from the "American Standard Definitions of Electrical Terms," published by the American Institute of Electrical Engineers, New York, and approved in 1941 by the American Standards Association.

GERMICIDAL LIGHTING FOR SCHOOLS AND UNIVERSITIES

By PAUL W. SEAGERS

Supervising Principal of the Cato-Meridian Central School, Cato, New York

WITH the advent of world peace and the resumption of school building programs there could be a mad scramble to utilize all types of new materials, equipment, and apparatus without much thought to their proven uses, efficiency, costs, or maintenance. Some types of advertising, pseudo-studies and experiments, desire for panaceas, and a general credulity in postwar wonders can easily precipitate this scramble. One of these greatly anticipated wonders is "germicidal lighting." The author, being very much interested in the use of germicidal lighting in the postwar planning of school buildings, thinks that it is time to eliminate the hocus pocus from this valuable development and to bring definite facts before the public.

Nature and Uses of Germicidal Lighting

"Germicidal lighting" is a misnomer because its actual visible lighting is of little or no importance and has no practical use as a source of usable light. What we really have is a quartz mercury geissler tube, or a special hard glass tube (ultra-violet rays do not penetrate ordinary glass), which, upon activation, will radiate ultra-violet monochromatic rays of approximately 2537 Å (Angstrom units) wave length which have definite bactericidal properties. In certain concentrations these rays can become very irritating, if not destructive, to sensitive human tissue.

There seem to be three main uses for germicidal lamps in schools: first, to irradiate the air of classrooms, corridors, gymnasiums, cafeterias, and places of assembly as part of the improved ventilation process and thus to lessen the explosive spread of airborne infection; second, to establish irradiant barriers around entrances to the cafeteria and food preparation centers, through whose lethal rays airborne germs and bacteria would be killed promptly (these barriers could also be used in the health rooms and sickness isolation areas now found in some of our modern buildings); and third, to irradiate refrigerators and certain sections of the food service counters, as well as dish and silverware storage areas and possibly dish-washing machines. Although these lamps are now used for irradiating toilet seats in public places, they do not seem to be necessary or desirable for school toilets under good custodial service. It is beyond the scope of this article to discuss the therapeutic uses of portable sun lamps of the ultra-violet type in schools.

Germantown and Swarthmore Experiments

A number of experiments with ultra-violet lighting have been carried on in schools during the past several years, several of a few weeks' or months' duration. As they have had little or no scientific planning, they have been, consequently, of no value and in some cases detrimental to the future of ultra-violet popularity. Other experiments have been definitely planned and carried out as long-term scientific experiments requiring the cooperation of medical doctors, engineers, nurses, statisticians, and teachers. Probably the best known experiment of the latter type is that taking place in the Germantown Friends School and the Swarthmore schools under the direction of Professor William Firth Wells and his talented wife, Doctor Mildred W. Wells, both on the faculty of the School of Medicine, University of Pennsylvania. They, in some instances with associates, have written more than seventy scientific articles on ultra-violet irradiation. The Germantown experiment was started in the fall of 1937, and the Swarthmore in the fall of 1940. The fixtures used in Germantown were of the central suspended type containing quartz tubes, while those used in Swarthmore were of the wall type (four to a room) containing 36″ General Electric germicidal lamps. These fixtures were approximately seven feet above the floor. Without going into details we will look at some of the conclusions drawn by the Doctors Wells.

By using Bacterium coli (Escherichia) atomizers, and spraying rooms with the ultra-violet lights turned on, they were able to determine the lethal effects of the lamps. These were found to be equivalent to the dilution of air in a room by fifty to one hundred air changes an hour while ordinary ventilating equipment can not give more than ten to twenty air changes an hour in winter weather and be practical. In other words, properly engineered and installed ultra-violet lights in a room will give results equivalent to the dilution of the air in that room by removing the ceiling. When we speak of dilution of air in these instances, we actually mean the dilution

of bacteria concentrations in the air, resulting in a diminution of the number of bacteria per unit volume.

It was also discovered that high relative humidity decreased the susceptibility of the organisms while low relative humidities increased the susceptibility of the microorganisms suspended in air. In fact, they found a tenfold difference in the killing power of the same light between 46% relative humidity and 91% relative humidity. This conclusion seemed to be substantiated in practice by an epidemic spread of mumps in a Swarthmore irradiated room during the mild, moist fall of 1941. Thus we see that germicidal lights in connection with ventilation are more efficient in cool dry weather, which is also the time that our natural and mechanical ventilation systems need assistance.

Aerosols vs. Irradiation

The control of, or limiting of, the explosive epidemic spread of airborne diseases in schools is largely a problem of ventilation; that is, dilution of germ concentrations in air, or killing the disease germs by means of aerosols or lethal rays. There are many interesting experiments with aerosols at the present time; however, for the average school building it appears much easier to keep a relative uniform intensity of ultra-violet irradiation than to keep a uniform chemical concentration in the air. We may find that aerosols are more desirable in climates with a high humidity or in buses which are difficult to irradiate.

Conclusions Drawn from Experiments

The Germantown and Swarthmore studies were concerned primarily with the spread of chickenpox, mumps, and measles. These were selected because first, it was believed that they are airborne diseases; second, they are children's diseases; third, the school was thought to be the place of first importance in the spread of these diseases; fourth, it was easy to classify the pupils into susceptibles and immunes; fifth, the incubation periods of these diseases are of such lengths as to aid the identification of secondary classroom incidence; and last, unlike colds, the reservoir of infection is rather small, excluding most adults and immunes.

There appears to be enough evidence to prove that proper ultra-violet irradiation of classrooms will diminish the secondary cases of mumps, measles, and chickenpox from classroom exposure by about two-thirds. However, there is little evidence made public at the present time to indicate that ultra-violet irradiation has diminished the number of primary cases. Thus, we might find germicidal lights most effective in the control of epidemics in rural schools because the rural school is relatively more important in the dissemination of infection than is the urban school where a majority of the exposures can come from outside the school.

At the present time there is no clear cut evidence that ultra-violet irradiation will decrease the epidemic spread of colds. As Professor Wells reports in the May 1945 issue of the *Scientific Monthly:*

> "multiple exposures to colds . . . obscure the benefit of preventing single infections. . . . Immunity being temporary, major fraction of the community harbor colds in winter, and this large reservoir of infection makes frequent exposure outside of the school inevitable, and identification of secondary incidence within the school impossible."

In addition the influence of clothing, heat, sleep, rest, diet, nervous tensions, and other factors makes the study of colds very difficult.

New York State Study

Another important study in the use of ultra-violet irradiation of air in schools is that conducted by the New York State Department of Health in cooperation with the General Electric Company. The Cato-Meridian Central School, of which the author is the supervising principal, is the experimental school, with



Cato-Meridian School, Cayuga County, New York. Here, the New York State Department of Health is conducting experiments to control epidemics of measles, chickenpox, and mumps by installation of ultraviolet ray lamps



Kindergarten of the Cato-Meridian School, showing ultraviolet ray lamps installed on side walls

its corridors and all rooms irradiated. The Port Byron Central School is half experimental, half control, with the corridors and half of the rooms irradiated. The Mexico Central School is the control school, with no germicidal lamps. These schools were chosen because they are about the same size, of recent construction, have school nurses, good maintenance programs, adequate school records, and are rural to the extent that most exposures to diseases come in school or on the school buses. At Cato-Meridian all pupils come by school-owned buses.

Dr. James E. Perkins, deputy commissioner of the New York State Department of Health, is director of the study. Dr. Anne M. Bahlke, medical consultant in communicable disease control, is in immediate charge of the medical aspects of the problem. The bacteriological surveys are being conducted by Mr. F. Wellington Gilcreas, assistant director of the Division of Laboratories and Research, and Miss Hazel V. Roberts, senior laboratory technician. Mr. Charles R. Cox, chief of the Bureau of Water Supply, is responsible for supervision of various engineering factors, particularly heating and ventilation, as they relate to the experiment. Mrs. Hilda F. Silverman, statistician, is concerned with correlation of the experimental data. All the results from this study, which is in its second year, will be released by the State Department of Health.

The technical aspects of installation and maintenance of ultra-violet equipment are under the supervision of Dr. L. J. Buttolph and Mr. Howard Haynes of the General Electric Company.

Setting and Controls in Experimental School

In the experimental school, three Hygeaire fixtures, each containing one 36″ General Electric germicide tube, are to be found in each room. They are located about seven feet from the floor, one in the front of the room, one on the inner wall, and one in the rear. This provides a primary irradiated zone in the room, from the fixture level to the ceiling, through which the germ and nuclei laden air will pass due to natural and mechanical ventilation currents. The lethal power of the rays in this zone is such that few bacteria and viruses can survive this journey. Below the primary zone, from the fixture level to the floor, is a secondary irradiated zone varying in intensity from one-tenth to one-fortieth that of the primary zone and receiving its rays by reflection. Although we do not know the exact relative importance of these two zones, we do know that, notwithstanding contradictions from some manufacturers, there is enough intensity in the second-



A corridor installation of an ultraviolet ray germicidal lamp

ary zone of 2800 Å waves to give a slight tanning effect to the exposed skin, and even sunburns and conjunctivitis when the reflectors have "hot spots," or the fixtures are not properly installed. The corridors are equipped with the Guth suspended-type fixture, also about seven feet from the floor.

All tubes and fixtures are dusted once a week, and intensity readings for every tube are made and recorded twice a month. Tubes falling below a certain intensity as recorded on a special meter are immediately replaced. Periodically, Doctor Balhke and her associates make a Bacterium Coli spray test in special rooms to determine the lethal power of the lamps. Once each month, they check in nine test rooms by exposing special Petri plate cultures for fifteen minutes at five points in each room; they also operate the Wells air centrifuge for a period of five minutes which allows a volume of five cubic feet of air to impinge upon a tube of special beef extract agar. The test plates are then rushed to the Syracuse laboratories for incubation and counting.

Special Records for the Study

In addition to these tests and the regular school records, special records for this study include: first, a report of every passenger on every bus trip; second, a comprehensive report on every case of measles, chickenpox, and mumps; third, class records following exposures; fourth, bus records following exposure; fifth, yearly summary of exposures; and sixth, operation of heating and ventilating equipment, kind of weather, direction and velocity of wind, relative humidity, air temperature, volume of fresh air brought into each room, and other pertinent data.

Besides these data, our nurse has determined as closely as possible just who are susceptible to each of the three diseases studied. Because of the flu or grippe epidemic in New York State during the fall of 1945, we are comparing our illness absences on account of colds, flu, and grippe with neighboring schools. Although our findings are not arrived at scientifically, it is generally known in this section that our absences amount to approximately 11%; in Syracuse, the figure was 26%; in other school systems the absences amounted to as much as 35%. We can not attribute our low absence rate solely, if at all, to the germicidal lamps, for other factors, such as good health habits, good nutrition, and outstanding school lunches, as well as being more or less isolated from large urban centers, certainly must have had some influence.

The psychological factors are often difficult to evaluate. Two weeks before our lights were turned on and about a month after notices were given out that we had installed the lights, a parent phoned to inform me that her children had not had any colds since the lights were installed, and she thought they were wonderful. It is very easy to have a feeling or sense of well-being and good health when occupying an irradiated room. It is equally easy to blame soreness of the eyes, need for glasses, or minor skin irritations to the presence of these lights. A person's head should never enter the primary irradiated zone for even a few minutes as a painful, temporary blindness can result from the direct rays of the tubes.

Variables Require Time for Study

This New York State Study is designed to run for twelve to fifteen years. The next major step is to irradiate the buses, or, if that is impractical, to introduce an aerosol generator into the bus ventilating system. The last and most ideal step in this study would be to install ultra-violet lamps in all public places and in as many homes as possible in this isolated area. Only by this latter step can we evaluate under field conditions the benefits derived from these lamps in maintaining healthful conditions and eliminating explosive spread of epidemics.

There is a little subjective evidence that ultra-violet irradiation kills some types of classroom odors; however, this may be due to a masking of the odor by the slight ozone odor given off by the tubes. Further field studies should be made in this connection.

In an experiment of this kind there are many variables some of which change rapidly. Thus we see that the size of the lamp, its power, radiant flux, lethal rating and quality of rays, hours of use, and cleanliness are important. The type of fixture, its efficiency, cleanliness, spread pattern and distribution, shape and material of the reflector are to be considered (Alzak aluminum is more efficient than chromium for reflectors although it seems more difficult to shape properly). Other factors are: the number and position of the fixtures, the size and shape of the room, the maximum distance the rays must travel, type of turbulence and rate of air circulation, relative humidity of the air, type of finish on walls and ceilings (flat oil paints are better than water diluted

casein paints), types and concentrations of microorganisms, dust particles, nuclei and Flugge droplets in the air, the number of susceptibles in a room, and the interspacing of susceptibles with immunes. So, when we hear of experiments conducted for a term of a few weeks or even months, we question the reliability of those experiments.

Considerations in Setting Up an Experiment

There are many types of fixtures on the market, most of the pan or trough style; some are suspended from the ceiling, and others are wall fixtures. Some have no front baffle while others have a front adjustable baffle of metal, and one has a front baffle of glass; some fixtures can be recessed into the walls. These all have the disadvantage of being dust and litter catchers. The fixtures should be as inconspicuous and small as possible, yet furnish the desired spread pattern for the primary zone and proper protection in the secondary zone.

It is thought now that two or three fixtures will take care of the average classroom while crowded rooms or places of crowded assemblage will require more. Rooms with large air reservoirs require fewer fixtures. The lamps should have special outlets; they should be on special lines controlled from the office of the head custodian or building superintendent, with tell-tale or indicator lights in the school office. These lines should be separated according to the use of the rooms; that is, day use, night, athletics, cafeteria, etc.; and be further separated according to exposures rather than by wings or sections of the building. For proper protection, the whole building (with possible exception of toilets, and we are not sure about this) should be irradiated. The tubes should be dusted and checked for intensity periodically because they frequently become of little value long before they cease to light. Extra tubes and starters should always be immediately available.

The pupils, teachers and public should be properly informed as to the purposes of the lamps, their dangers, and their beneficial effects, otherwise rumors will tend to build them up into "fountains of youth" or "death dealing devices," either of which is detrimental to the school. The lights should be installed in no school unless the staff is willing to expend the time and energy necessary to have them function properly. The installation should be made during the summer, and the lights turned on when school opens in the fall. In some cases, abrupt exposure to these lamps in the middle of the winter is disconcerting to people with very fair complexions.

This entire discussion has been on improving ventilation by the use of germicidal lights; it was not deemed necessary to discuss irradiant barriers or irradiation of refrigerators and food service sections, which are accepted practice in many hospitals, meat markets, and food stores, as these facilities, particularly irradiant barriers, are likely to be considered a part of the whole irradiation plan.

Summary

1. Under certain conditions ultra-violet lamps will reduce up to two-thirds the secondary cases of mumps, measles and chickenpox incident to classroom exposure.
2. There is still a question, due primarily to the difficulty of studying colds, as to the value of germicidal lamps in controlling cold epidemics.
3. High relative humidity decreases the efficiency of ultra-violet lights.
4. Rural or isolated areas are likely to show the most beneficial results because they do not have the reservoirs of infection found in urban areas.



Wells air centrifuge (towards rear) is set up for a period of five minutes, allowing a volume of five cubic feet of air to impinge upon a tube of beef extract agar

5. Irradiation of a few rooms in a building is ineffective. The whole building should be irradiated.
6. Only oil paints should be used in rooms to be irradiated.
7. The lamps should receive their power through separate lines controlled in the custodial office, with tell-tale lights in the school office. These lines should be zoned according to the use of the rooms and exposures.
8. The tubes must be cleaned and checked for intensity periodically.
9. Teachers, pupils, and public must be acquainted with the dangers as well as the values of ultraviolet irradiation.
10. Germicidal lamps may also be used in schools for barrier irradiation around cafeterias, food preparation rooms, health rooms, and sickness isolation areas. A further use is in refrigerators, in dishwashers, over food service areas and in dish and silverware storage.

REFERENCES

1. General Electric Company. "The Lamp That Kills Germs." Nela Park, Cleveland 12, Ohio, 1945. 14p.
2. General Electric Company. "Germicidal Radiation." Nela Park, Cleveland 12, Ohio, January 1945. Reprint G.S.2. 32p.
3. Higgons, Reginald A. and Hyde, Gertrude M. "Observations After One Year of Ultra-Violet Air Sterilization in a Children's Hospital," *Hospitals* (December 1943). 4p.
4. Wells, William Firth. "Bactericidal Irradiation of Air," *Journal of the Franklin Institute*, Vol. 220, #3 (March 1940). 25p.
5. Wells, William Firth. "Infection, Disinfection and Air Conditioning," *Industrial Medicine*, Vol. 10, #7 (July 1941). 6p.
6. Wells, William Firth. "Air Disinfection in Day Schools," *American Journal of Public Health*, Vol. 33, #12 (December 1943). 8p.
7. Wells, William Firth. "Sanitary Ventilation by Radiant Disinfection," *The Scientific Monthly*, Vol. 60 (May 1945). Pp. 325–334.
8. Wells, William Firth and Wells, Mildred Weeks. "Air-Borne Infection," *Journal of the American Medical Association*. Vol. 107 (November 21, 1936). Pp. 1698–1703.
9. Wells, William Firth and Wells, Mildred Weeks. "Measurement of Sanitary Ventilation," *American Journal of Public Health*, Vol. 28, #3 (March 1938). Pp. 343–350.
10. Wells, William Firth; Wells, Mildred Weeks; and Wilder, T. S. "The Environmental Control of Epidemic Contagion," *American Journal of Hygiene*, Vol. 35, #1 (January 1942). Pp. 97–121.

GERMICIDAL FIXTURE MANUFACTURERS

American Sterilizer Company, Erie, Pennsylvania
The Art Metal Company, 1814 E. 40th St., Cleveland 3, Ohio
Edwin F. Guth Company, 2615 Washington Blvd., St. Louis 3, Missouri
Tru-Air Ultraviolet Products Co., 1019 N. Madison Ave., Los Angeles 27, California
Wilmot Castle Company, Rochester 7, New York

GERMICIDAL LAMP MANUFACTURERS

General Electric Company, Nela Park, Cleveland 12, Ohio
Hanovia Chemical & Mfg. Co., 233 N.J.R.R., Newark, New Jersey
Sylvania Electric Products, Inc., 60 Boston St., Salem, Massachusetts
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pennsylvania



REVISION OF NEW YORK STATE'S REGULATIONS ON HEATING AND VENTILATION OF SCHOOL BUILDINGS

By DON L. ESSEX

Director, School Building & Grounds Division, New York State Education Department, Albany

UNTIL 1940 the New York State Education Law provided that classrooms should contain 200 cubic feet of air space per pupil, that pure air should be introduced at the rate of at least 30 cubic feet per minute per pupil, and that the facilities for exhausting the foul air or vitiated air should be positive and independent of atmospheric changes.

These statutory requirements were supplemented by Commissioner's regulations which provided a minimum standard of room temperature of 70° Fahrenheit in zero weather and 35 per cent humidity.

In 1940 the Education Law was amended to read:

> The commissioner of education shall not approve the plans for the erection of any school building, or addition thereto, or remodeling thereof unless the same shall provide facilities for heating and ventilation adequate *to maintain healthful and comfortable conditions in the classrooms and study halls.*

In the spring of 1944 the School Buildings and Grounds Division and the Research Division of the New York State Department of Education joined their efforts in a study to determine what standards of heating and ventilation should be set up to "maintain healthful and comfortable conditions" in school buildings. Funds for the furtherance of the study were made available through the Research Division.

Advancement of the Study

In March of 1944 Mr. Paul W. Seagers, supervising principal, Cato-Meridian Central School, was called to the state department to spend a month reviewing the research which had been done in this field. Mr. Seagers submitted a report which became a valuable springboard for the further advancement of the study.

At about this time a special committee was appointed to assist the department in the study, and later consultants were employed to continue the investigation begun by Mr. Seagers and to submit a report which could be used as a basis for the Commissioner's Regulations.

The names of the committee members are as follows:

Charles B. Cox
Chief of Bureau of Water Supply
State Department of Health, Albany, N. Y.

George B. Cummings, Architect
Binghamton, N. Y.
Dr. N. L. Engelhardt
Associate Superintendent of Schools
New York, N. Y.
Dr. Ray L. Hamon
Senior School Building Specialist
U. S. Office of Education, Washington, D. C.
Dr. James E. Perkins
Director of Division of Communicable Diseases (now Deputy Commissioner)
State Department of Health, Albany, N. Y.
Paul W. Seagers
Principal, Cato-Meridian School, Cato, N. Y.
Adrian B. Waterbury
Engineer, representing Clyde R. Place
New York, N. Y.

The consultants were:

Dr. C. E. A. Winslow
Director, John B. Pierce Laboratory of Hygiene
School of Medicine, Yale University
Philip E. Nelbach
Assistant Professor of Public Health
School of Medicine, Yale University

In addition, the following persons participated in the conferences and assisted in advancing the study:

From the School Buildings and Grounds Division:
Dr. W. K. Wilson
From the Division of Housing and Business Administration, New York City Board of Education:
Charles Clevette, Thomas J. Dwyer, Jules L. Haut, Morris Liebeskind, James T. Powers, William A. Viet, Jr.

Regulations Considered and Approved

Three conferences were held during the year 1944-45. Dr. J. Cayce Morrison, assistant commissioner for research, presided at each conference. At the first meeting the problem was fully defined and an outline of procedure determined. At the second meeting the consultants presented a preliminary report which was thoroughly discussed by the committee and certain revisions and further studies requested. At the third meeting a final report was submitted which, with suggestions for minor changes, was adopted unanimously by the committee.

From this report proposed Commissioner's Regulations on heating and ventilation were drawn. They were approved by the Board of Regents on November 16, 1945. The regulations as approved follow.

To obtain the approval of the Commissioner of Education of plans and specifications for heating and ventilating, there shall be compliance with the following requirements:

1. *Thermal environment during the heating season*

a. Heating systems shall be so designed and guaranteed that when properly installed and operated they will meet the following standards.

Type of Space	Design Operative Temperature [1]	Corresponding Room Air Temp.[2]
(1) Sedentary activity, as for example in classrooms, auditoriums, offices, cafeterias	70°	68°–72° (30″ above floor)
(2) Moderate activity, as for example in corridors, stairways, shops, laboratories, kitchens	68°	66°–70° (60″ above floor)
(3) Vigorous activity, as for example in gymnasiums	65°	60°–70° (60″ above floor)
(4) Special cases—lockers and shower rooms	78°	76°–80° (60″ above floor)
swimming pool area	83°	80°–86° (60″ above floor)

[1] The operative temperature represents the mean effect of the temperature of the air of a room and of its walls. Under normal conditions walls and air exert approximately equal effects; but if a room has three cold exterior walls a higher air temperature will be necessary for comfort than in the case of a room with a single exterior wall exposed to the sun but not to the prevailing winds.

[2] The lower figure of air temperature in each case is for a room with relatively warm walls; the second figure, for a room with relatively cold walls.

b. Maximum air temperature gradient from floor to 60″ above floor shall not exceed 5° and preferably shall not exceed 3°.

c. Air movement in zones of occupancy shall not exceed 25 linear feet per minute.

2. *Thermal environment during the nonheating season*

a. Where extensive summer use of rooms in a school building is anticipated in any area where outdoor summer temperatures are high, the Department may require the installation of air-conditioning systems designed to produce inside temperature as indicated below:

Outdoor Temperature	Inside Temperature
80°	75°
90°	78°
95°	80°

b. As an alternative to the above, the Department may require electric fans or similar apparatus which will increase turbulent air movement within such spaces as those specified above to 100 feet per minute.

3. *Atmospheric hazards and quality*

a. In classrooms, provision for air change shall be made which, in the judgment of the Department, will provide a minimum air change of 10 cubic feet per minute per occupant. For effective thermal operation in mild weather a design factor of 15 cfm is desirable.

b. In rooms planned for close assembly a minimum air change of 10 cfm per occupant shall be provided in order to remove odors. Additional air change, depending largely upon wall exposure, may be required for effective thermal operation in mild weather.

c. In rooms where there is danger of toxic substances occurring in large concentrations, or where odors are likely to be strong, or where overheating is likely to occur, special ventilating equipment adequate to relieve the situation and entirely independent of the ventilating system serving the rest of the building, shall be installed.

4. There shall be furnished with the plans and specifications a brief, clear and nontechnical description of the heating and ventilating system together with instructions for operation.

Standards Have Two Goals

The regulations are based on the fundamental thesis that heating and ventilating standards should achieve two purposes.

1. Provide proper thermal environment in the classroom.
2. Eliminate odors and toxic substances from the atmosphere.

1. *Proper thermal environment*

In cold weather excessive heat loss from the human body should be prevented by raising the temperature of the room through the operation of the heating plant.

In mild weather the problem is more often one of *permitting* adequate heat loss from the human body;

that is, a problem of cooling. The human heat liberated alone, or combined with sun heat, often exceeds that escaping through the building structure. Cooling, therefore, may be needed even after the heating plant has been turned off either by automatic control or by hand.

At the higher outside temperatures the problem can be solved rather simply—windows are opened when the room temperature gets too high.

Relative humidity plays but a minor role in thermal comfort at customary indoor winter air temperatures since a change of 25 per cent is the equivalent of only a single degree Fahrenheit change in air temperature.

A proper thermal environment can be more easily attained if it has been considered a factor in the orientation of the building and if structural materials used have maximum insulating value with minimum heat capacity.

However, chief reliance in attaining a proper thermal environment must necessarily be placed on the heating and ventilating system. Among the types available five of the most important are:

1. Direct heating with window air supply and gravity exhaust.
2. Direct heating with window air supply and forced exhaust.
3. Direct heating with forced unit ventilator air supply and corridor gravity exhaust.
4. Forced warm air with central or zone fans.
5. Panel heating with window air supply and gravity or forced exhaust.

Recirculation has no value except to preheat a cold unoccupied room.

2. *Elimination of odors and toxic substances*

Any of the heating and ventilating systems described in the foregoing discussion will under ordinary conditions eliminate odors if the systems are operated to introduce 10 cubic feet of fresh air into the classroom. Where odors are likely to be unusually strong, this requirement will need to be increased; in certain areas of the school building, e.g. toilets, special ventilating equipment should be installed.

Gases and fumes should be removed from the classroom by means of special ventilating equipment.

Bacteria and viruses are now known to be carried in viable state considerable distances in slow-moving masses of air and in streams moving through ventilating ducts. Air disinfection is a new, busy, and rapidly moving field of research. The New York State Department of Health is now conducting air experiments in three public schools in the state to determine the value of ultra-violet lamps in removing air-borne infection.[3] No recommendations can be made or standards set at this stage of experimentation in this field.

[3] See preceding article, beginning on page 225.

BUREAU OF PLANT OPERATION AND MAINTENANCE
BOARD OF EDUCATION ---- CITY OF NEW YORK

COMMITTEES
STAFF COMMITTEE
COMMITTEE ON PROCEDURES
ADVISORY COMMITTEE ON OPERATION
COMMITTEE ON CUSTODIAL PERSONNEL
IN-SERVICE TRAINING COMMITTEE
COORDINATING COMMITTEE

RESEARCH AND STANDARDS SECTION
Secy. of Coordinating Committee
Post-War Program • Research on Maint. • Oper. & Admin. Problems

SUPERINTENDENT
Management • Operation • Maintenance • Repair • and • Protection of Board of Education Property

PERSONNEL	(1945-46)	BUDGET	
185 Administrative Empl.	548,752	Maintenance Contracts	3,300,000
239 Shop Mechanics, Etc.	530,843	Operation(Fuel & Power)	3,114,024
749 Custodians & Sup.	7,557,242	Personnel	8,624,837
3180 Custodial Employees)		Materials, Supplies, Etc.	282,682
4373 TOTAL =	8,634,837	TOTAL =	15,261,543

SPECIAL ASSIGNMENTS

MAINTENANCE DIVISION
Structural Safety • Repair and Maintenance • Health and Fire Protection

ADMINISTRATIVE DIVISION
Administrative Procedure

OPERATING DIVISION
Operation and Protection of Property

INSPECTION SECTION
Inspect Work
Prepare Specifications
Approve Bills
Prepare Maint. Budget
Report on Fires, Unlawful Entries, Vandalism, Etc.

ENGINEERING SECTION
Prepare and Review Plans and Specifications for Alterations
Review Specifications Prepared by Inspection Section.

PERSONNEL SECTION
Personnel Ratings and Records
Computation of Custodial Compensation
Custodial Monthly Financial Reports
Prepare Resolutions on Personnel
Automotive Service

CONTRACT & FISCAL SECTION
(Maintenance Work Only)
Assembling & Control of Budget
Maintenance Cost Records
Advertise Contract Work
Prepare Maintenance Resolutions
Contractors' Qualifications and Lists
Issue Plans and Specifications

SHOPS SECTION
Make Repairs to Buildings and Furniture.
Order and Store Materials

DIRECT SERVICE UNIT

PLANT OPERATION SECTION
Clean Buildings.
Heat and Ventilate Buildings.
Protect Buildings.
Make Minor Repairs.

FUEL MANAGEMENT UNIT

BORO OFFICES
- MANHATTAN
- BRONX
- BROOKLYN
- QUEENS
- RICHMOND

- BUILDING UNIT
- SANITARY UNIT
- ELECTRICAL UNIT
- SCHOOL SHOP & MACHINERY UNIT
- PRIORITIES UNIT
- HEAT. & VENT. UNIT
- FURNITURE UNIT
- DESIGN UNIT

- PERSONNEL RECORDS UNIT
- CUSTODIAL COMPENSATION UNIT
- TRANSPORTATION UNIT

- BUDGET AND BUDGET CONTROL UNIT
- CONTRACTS, ORDERS AND PAYMENTS UNIT
- SPECIFICATIONS TYPING UNIT

RECORD AND SUPPLIES SECTION
Distribution of Mail
Filing • Office Supplies
Inventory
Reproduction
Records on Accidents, Fires, Vandalism, Etc.

- FILES AND REPORTS UNIT
- SUPPLIES AND INVENTORY UNIT
- REPRODUCTION UNIT (Mimeograph . Multilith) Distribution of Mail

MECHANICAL SHOPS UNIT
- MACHINIST SHOP
- PLUMBING SHOP
- ELECTRICAL SHOP
- STEAMFITTERS SHOP
- THERMOSTAT REPAIR SHOP
- SHEET METAL SHOP

BUILDING SHOPS UNIT
- CARPENTRY SHOP
- FURNITURE MAINTCE SHOP
- PAINTING SHOP
- DOOR CHECK SHOP
- LOCKSMITH SHOP
- CLOCK REPAIR SHOP
- GENERAL

SHOP ADMINISTRATION UNIT
Payroll, Personnel & Time Records — Cost Records
General Storeroom and Inventory — Trucking

REGIONAL UNIT NO. 1
- DISTRICT A
- DISTRICT B
- DISTRICT C
- DISTRICT D
- DISTRICT E
- DISTRICT F

REGIONAL UNIT NO. 2
- DISTRICT G
- DISTRICT H
- DISTRICT I
- DISTRICT J
- DISTRICT K
- DISTRICT L

MAINTENANCE AND REPAIR BY NEW YORK CITY'S BOARD OF EDUCATION SHOPS

By HAROLD D. HYNDS

Superintendent, Bureau of Plant Operation and Maintenance

New York City Public Schools

and LOUIS TREMEL

General Foreman of Shops

THE Bureau of Plant Operation and Maintenance of the New York City Board of Education operates two extensive maintenance and repair shops which do about 20 per cent of the maintenance work of the bureau. The volume of the work done in these shops has practically trebled during the past seven years because they can execute emergency orders more promptly and economically than was possible under the contract system.

Organizational Plan of the Shops

The capital investment of the New York City Public School System in buildings, equipment, and grounds is more than $600,000,000. Since the investment in physical plant and equipment is so large, the work done by the shops is proportionately large in volume and in dollar value. It does not follow, however, that a clearly defined shop organization for maintenance work is necessary *only* in the case of very large school organizations. We believe that the organization outlined for this large system could be followed in principle by much smaller school systems.

The accompanying chart shows the organization of the whole Bureau of Plant Operation and Maintenance with its three main divisions—maintenance, administration, and operation. Under the operating division is shown the shops section with its various units.

This chart shows that in each of the five boroughs the bureau has an office directed by a borough head. Serving under him is a group of building inspectors, sanitary inspectors, heating and ventilating inspectors, electrical inspectors and so on. These are the individuals who inspect the school buildings in their particular areas and initiate repairs.

If a job is urgent, or if requirements are hard to foresee, or complete specifications difficult to write, the job is given to the shops. Otherwise, it is let through public bidding.

If the repairs are of such a nature as to require plans and specifications, these are either prepared in the borough offices and sent to the engineering office for review, or the field memorandum of required work is sent to the engineering office for preparation there of the plans and specifications. They are then sent to the administrative office for processing.

If the maintenance repairs initiated by the inspector are of routine or standardized form and are to be performed by the shops, the job does not go to the engineering department for technical review, but is given directly to the shops for execution. It might be mentioned here that there are jobs on which inspectors do not have to initiate repair work. For example, in case of a heating or electrical breakdown, school principals call the borough head directly, and mechanics are sent out immediately from the shops to make repairs. We have equipped station wagons and trucks with repair parts and tools, including pipe vises and standard tools for each trade, as for example, plumbing shop truck, electric shop truck, and heating and thermostat truck.

Type of Work Done by the Shops

Work done by the bureau shop mechanics falls into the following categories:

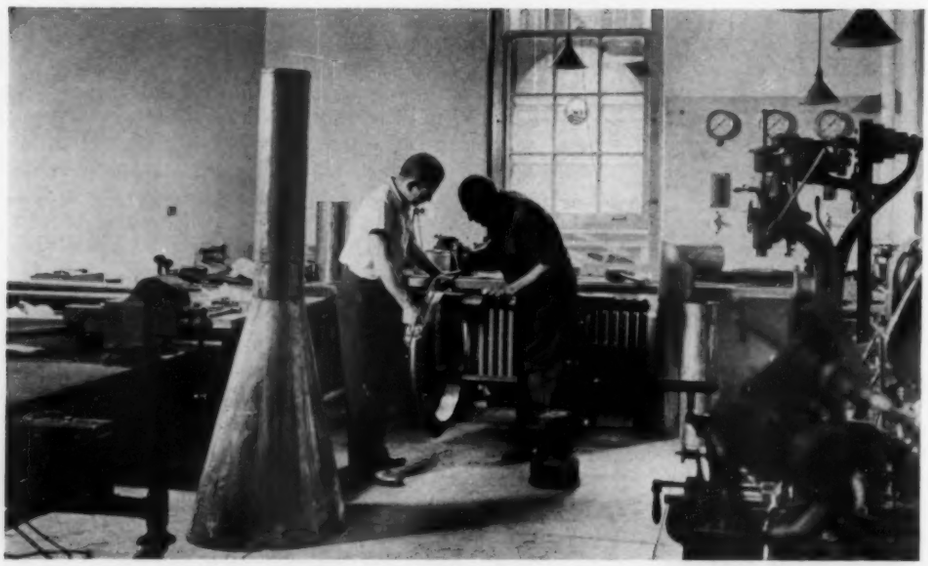
1. *Emergency repair work.*—Many electrical, plumbing, or heating breakdowns must be promptly repaired for safety and property protection. Often such work must be done within a very short time if school schedules are to proceed as usual, or if extensive property damage is to be prevented. The shops hold the proud record that no school has ever remained closed because of faulty or delayed maintenance care.

2. *Repair work not of an emergency nature but which cannot be completely or accurately described in specifications.*—Furniture repair, door check repair, and precision instrument repair are examples of this type of job. It is the policy of shop mechanics to make all repairs they find necessary after close inspection of a job.

3. *Repairs to equipment where special parts, such as lathe gears and machinery parts, must be obtained from the manufacturer.*

4. *Repairs which can be made from materials in shop inventory.*—When furniture or equipment is beyond repair, parts may often be salvaged and parts put in stock for future use in repairing another similar item. During the war years, it was impossible for the Board of Education to buy new furniture or equipment, and the shops were able to continue with many needed repairs because of their supply of salvaged items. For example, eighty old woodworking benches in very poor condition were collected, repaired, and refinished equal to new ones. The prewar cost of a





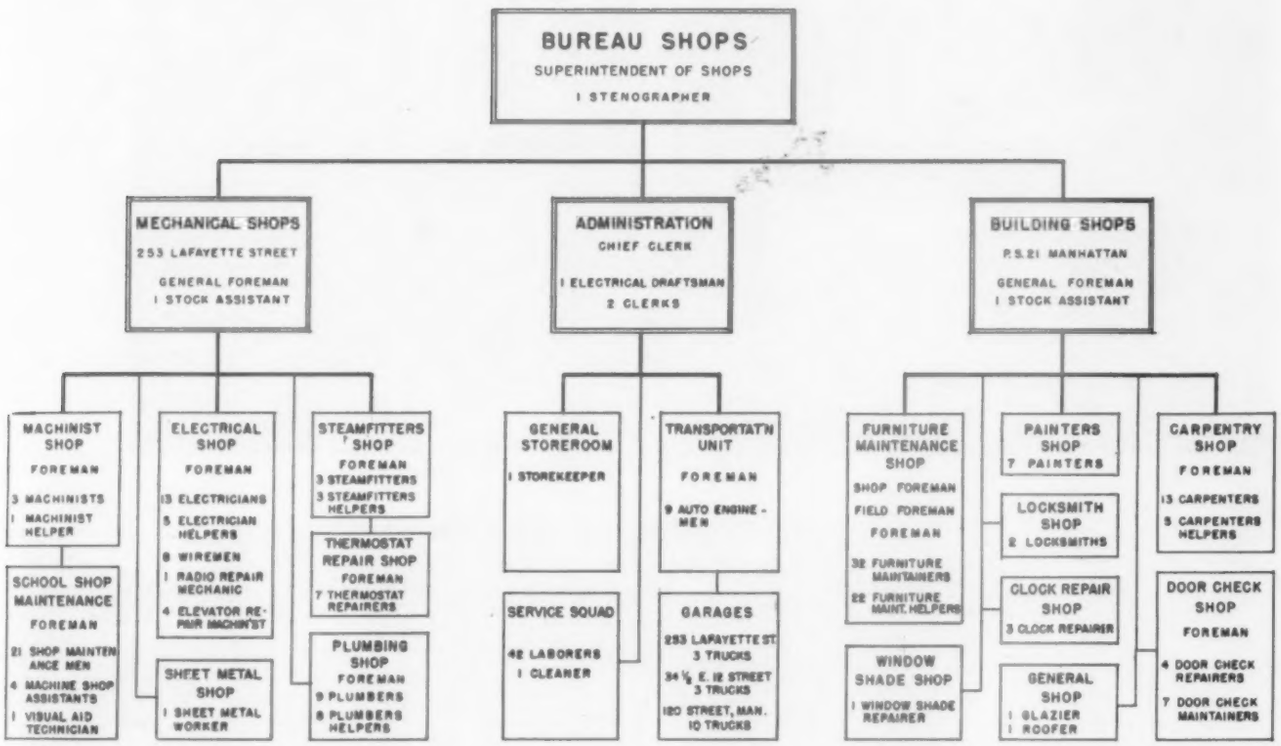
Jobs done in the precision shop (above) come under the category of work that "cannot be completely or accurately described in specifications"

The sheet metal shop (left) contributes to the task of keeping school equipment operating uninterruptedly



Electrical shop (right). Electrical repairs account for a large part of the work done by the school shops. In cases of emergency, mechanics go out in trucks equipped with parts and tools to do on-the-spot repairs

ORGANIZATION CHART OF SHOP SECTION
BUREAU OF PLANT OPERATION AND MAINTENANCE
HAROLD O. HYNDS, SUPERINTENDENT



new bench was $88. The cost of repairing was $32 each. This represents a saving of about $4,500 on these eighty benches.

5. *Storage and transportation of equipment: educational materials, tools, and spare parts.*

Personnel of the Shops

It is the responsibility of the general foreman of shops to watch the performance of each shop unit for the cost of doing the work, and for standards of workmanship. This care is particularly necessary in furniture repair, as repair might in some cases be more costly than new units.

One of our two central shops is located at 253 Lafayette Street, Manhattan. This shop does electrical, plumbing, steamfitting, thermostat, and sheet metal work. The other shop is located at 199 Elizabeth Street, Manhattan. Here furniture is refinished and painted; door checks are cleaned and repaired, and general carpentry work is done.

The bureau shops have approximately 200 mechanics. These employees have civil service status and tenure, with pension rights and vacation allowance. They include carpenters, glaziers, roofers, millwrights, door-check repairmen, locksmiths, painters, window shade and upholstery repairers, furniture maintainers, plumbers, steamfitters, electricians, sheet metal workers, machinists, thermostat repairmen, and precision instrument mechanics. Approximately two thirds of our shop employees work out of the shops, in the various school buildings; the remaining one third have permanent assignments in the various shop units. The payroll of the shops at the present time is approximately $500,000 a year.

Comparative Costs of Shop and Contract Work

Comparative cost controls are made through periodic spot checks and test cases of particularly advantageous contract work and then checking with shop performance of similar work. Costs are regularly determined through the very detailed monthly reports of the material and labor costs of all jobs executed in the shops. This report shows what any job, done in any school plant, actually costs.

The business system and cost accounting in our work orders, from their inception and on through to the completion of the work, are very important and particularly so in the necessary check of balancing the cost of doing work through our own shops as contrasted to contracting the work by competitive bidding.

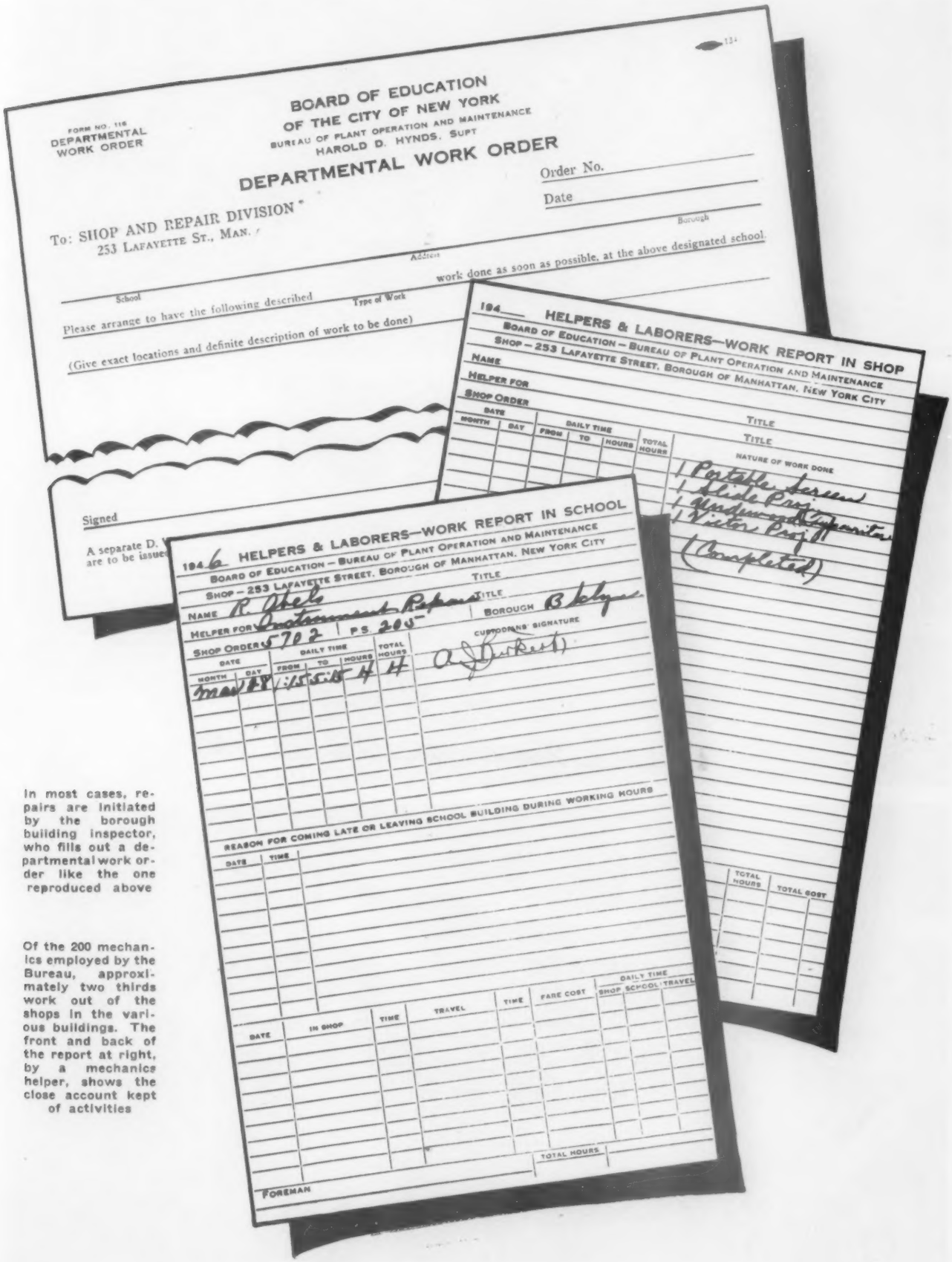
The shops buy all materials in large quantities through public bidding. Therefore, they usually get materials more cheaply than do individual contractors. They are also able to make real savings by the system of stocking salvaged parts, a practice which was described earlier. Overhead is kept to a minimum by having shops centralized. Through repetitive action, workmen become skilled in the special types of work encountered in school building repair. Because of all these factors, it is estimated that most repair and maintenance work of the type done by the shops





Machine shop, door check shop and plumbing shop (from top to bottom). The work done by the Board of Education shop mechanics amounts to about 20 per cent of the maintenance work in the New York City public schools





BOARD OF EDUCATION
OF THE CITY OF NEW YORK
BUREAU OF PLANT OPERATION AND MAINTENANCE
HAROLD D. HYNDS, SUPT

FORM NO. 116
DEPARTMENTAL
WORK ORDER

DEPARTMENTAL WORK ORDER

Order No.
Date

To: SHOP AND REPAIR DIVISION
253 LAFAYETTE ST., MAN.

School Address Borough

Please arrange to have the following described Type of Work work done as soon as possible, at the above designated school.

(Give exact locations and definite description of work to be done)

Signed

A separate D.
are to be issue

194 HELPERS & LABORERS—WORK REPORT IN SHOP

BOARD OF EDUCATION – BUREAU OF PLANT OPERATION AND MAINTENANCE
SHOP – 253 LAFAYETTE STREET, BOROUGH OF MANHATTAN, NEW YORK CITY

NAME
HELPER FOR
SHOP ORDER

DATE | DAILY TIME | TOTAL HOURS | TITLE

MONTH | DAY | FROM | TO | HOURS

TITLE

NATURE OF WORK DONE

1 Portable Screen
1 Slide Projector
1 Opaque Projector
1 Victor Projector
(Completed)

TOTAL HOURS | TOTAL COST

194 6 HELPERS & LABORERS—WORK REPORT IN SCHOOL

BOARD OF EDUCATION – BUREAU OF PLANT OPERATION AND MAINTENANCE
SHOP – 253 LAFAYETTE STREET, BOROUGH OF MANHATTAN, NEW YORK CITY

NAME R. Abels TITLE
HELPER FOR Instrument Repair TITLE
SHOP ORDER 5702 | P.S. 205 BOROUGH Bklyn

CUSTODIANS' SIGNATURE

DATE | DAILY TIME | TOTAL HOURS

MONTH | DAY | FROM | TO | HOURS

Mar 27 | 8:15 | 12:15 | 4 | 4

REASON FOR COMING LATE OR LEAVING SCHOOL BUILDING DURING WORKING HOURS

DATE | TIME

DATE | IN SHOP | TIME | TRAVEL | TIME | FARE COST | DAILY TIME SHOP | SCHOOL | TRAVEL

TOTAL HOURS

FOREMAN

In most cases, repairs are initiated by the borough building inspector, who fills out a departmental work order like the one reproduced above

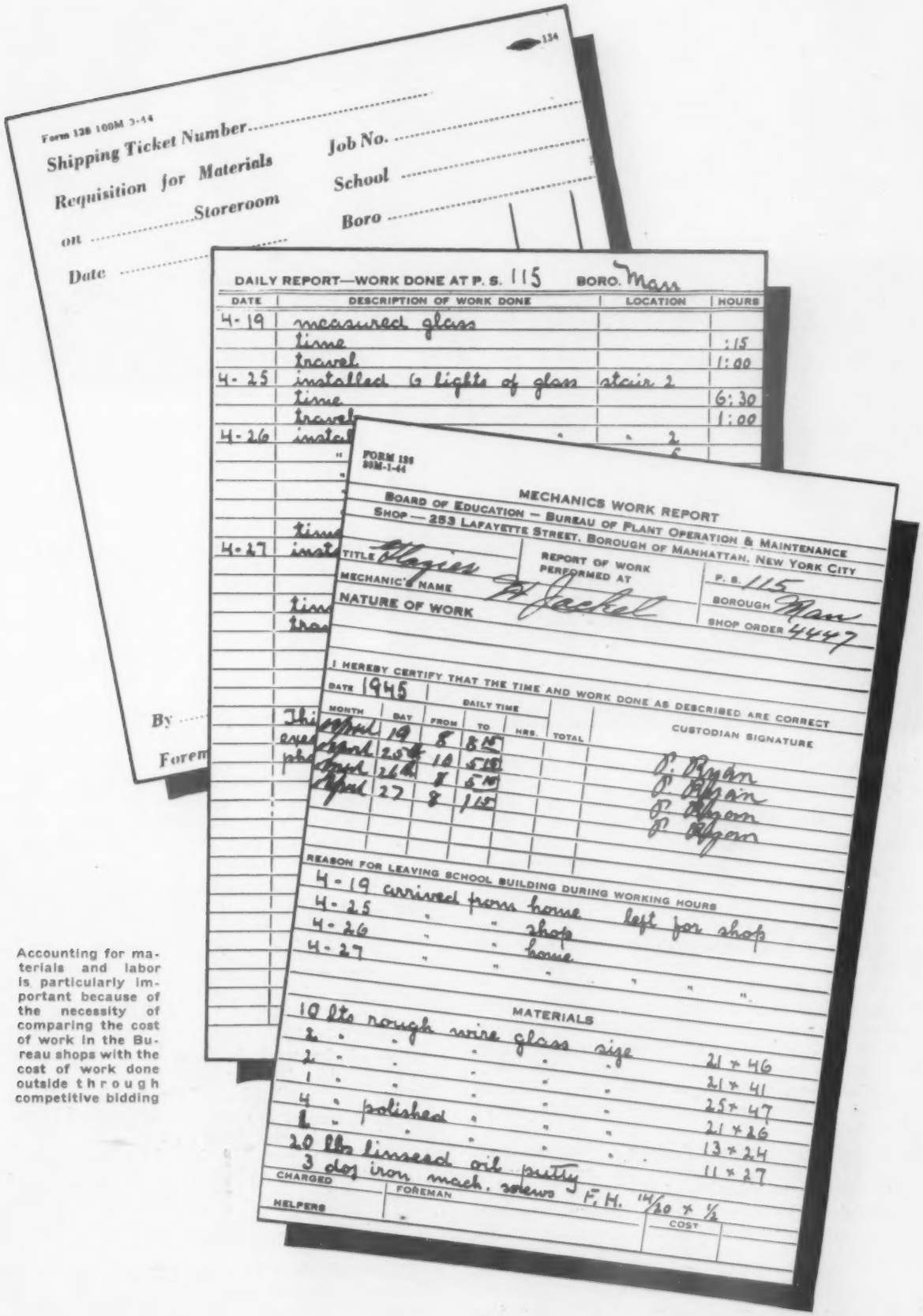
Of the 200 mechanics employed by the Bureau, approximately two thirds work out of the shops in the various buildings. The front and back of the report at right, by a mechanics helper, shows the close account kept of activities





These pictures indicate two reasons for the lowering of repair and maintenance costs in the New York City schools. One is skilled performance by workmen experienced in doing the special types of work encountered in school building repair. The other is the policy of stocking salvaged parts, which not only is economical but during the war made it possible to make many repairs when the needed parts were otherwise unobtainable





Form 128 100M 3-44

Shipping Ticket Number.....

Requisition for Materials

on .....Storeroom

Date .....

Job No. .....

School .....

Boro .....

By .....

Foren

DAILY REPORT—WORK DONE AT P. S. 115 BORO. Man

DATE	DESCRIPTION OF WORK DONE	LOCATION	HOURS
4-19	measured glass		
	time		:15
	travel		1:00
4-25	installed 6 lights of glass	stair 2	
	time		6:30
	travel		1:00
4-26	instal	2	
4-27	inst		

FORM 128
50M-1-44

MECHANICS WORK REPORT

BOARD OF EDUCATION — BUREAU OF PLANT OPERATION & MAINTENANCE

SHOP — 253 LAFAYETTE STREET, BOROUGH OF MANHATTAN, NEW YORK CITY

TITLE Glazier

MECHANIC'S NAME H Jackel

REPORT OF WORK PERFORMED AT P. S. 115

BOROUGH Man

SHOP ORDER 4447

NATURE OF WORK

I HEREBY CERTIFY THAT THE TIME AND WORK DONE AS DESCRIBED ARE CORRECT

DATE 1945

MONTH	DAY	DAILY TIME FROM	TO	HRS.	TOTAL	CUSTODIAN SIGNATURE
April	19	8	8 15			J. Ryan
April	20	10	5 15			J. Ryan
April	26	8	5 15			J. Ryan
April	27	8	1 15			J. Ryan

REASON FOR LEAVING SCHOOL BUILDING DURING WORKING HOURS

4-19 arrived from home left for shop

4-25 " " shop

4-26 " " home

4-27 " " " " "

MATERIALS

10 lts rough wire glass size		21 x 46
2 " " " "		21 x 41
2 " " " "		21 x 41
1 " " " "		25 x 47
4 " polished " "		21 x 26
8 " " " "		13 x 24
20 lbs linseed oil putty		11 x 27
3 doz iron mach. screws F. H.	1¼	20 x ½

CHARGED

FOREMAN

HELPERS

COST

Accounting for materials and labor is particularly important because of the necessity of comparing the cost of work in the Bureau shops with the cost of work done outside through competitive bidding



Right—Excess furniture is brought to a storeroom where it is kept for re-use



Left—Salvaged items as well as other small materials are neatly stored here

can be done for about thirty per cent less by the shops than by individual contract.

Our Central Warehouse

When the central shops were organized in 1938, it was foreseen that one of the most urgent requirements would be for a warehouse in which materials and equipment could be kept for re-use. Old Public School 97 was designated as a furniture warehouse, and another building with approximately 150,000 square feet of floor area is now being converted into a warehouse. Installation of elevators is now in progress.

All excess and unused furniture is brought to the warehouse from all school buildings. That which is obsolete or unusable, or for which repair and handling costs would be prohibitive, is scrapped. If there is an immediate demand for material, it is repaired and routed back to the schools. Other equipment is stored until needed.

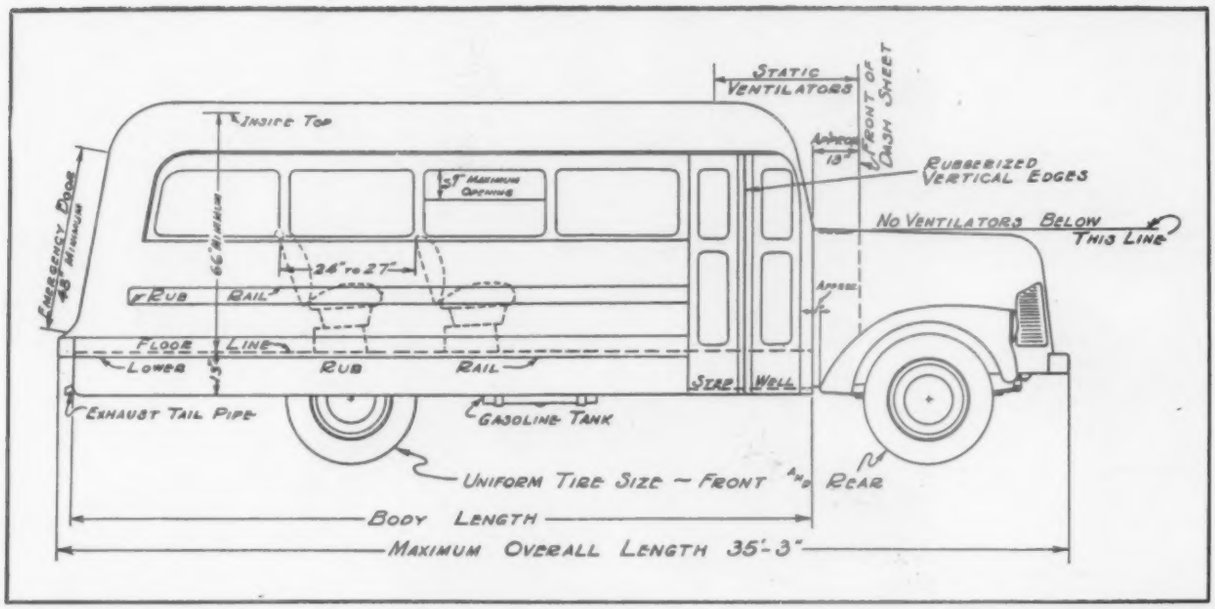
When the present crises of reconversion are over, the value of our central warehouse will increase manifold. It will then be the duty of our bureau to foresee with precision the annual needs in furniture and equipment so that purchasing can be made to full advantage.

The Strayer Report

A good over-all picture of contract and bureau shop maintenance work is given in the report which was made to the New York State legislature in 1943 on the administration and financing of the New York City Public Schools. Dr. George D. Strayer directed the survey, which began in 1940. That part of the "Strayer Report" which deals with the bureau shops states in part:

> "About 80 per cent of the maintenance work in the public schools is done by contract, 12 per cent by the Board of Education shop mechanics, and 8 per cent by the custodial staff. It is interesting to compare this practice with that found in other large city school systems. A study ("Study of the Chicago School Plant," by T. C. Holy) of ten cities, surveyed in 1941, revealed that in Boston 90 per cent of the work is done by contract, while in Philadelphia 100 per cent is done by Board of Education mechanics. In only three of the ten cities studied does contract work exceed 50 per cent of the total work done . . .
>
> "It is not suggested that the school maintenance work be shifted entirely from the contract plant to a school shop plan. There is much to be gained by continuing a substantial share of the contract work, possibly as much as 50 per cent of the total volume."

The work done by the bureau shops during the fiscal year 1944-45 amounts to about 20 per cent of the maintenance work done each year in New York City Public Schools.



From School Bus Standards, 1945 revised edition

Side elevation, showing principal features of a bus body

SCHOOL BUS STANDARDS

By GLENN E. FEATHERSTON

Specialist for Pupil Transportation, U. S. Office of Education, Washington D. C.

THE transportation of children to and from school has become one of the most important of the auxiliary services rendered by the school. In 1943-44 more than 4,000,000 children were transported daily at a total annual cost of more than $105,000,000. The need for this service continues to increase, and there is no way to estimate accurately the extent of the need ten years from now. In view of the increasing importance of pupil transportation, it is important that certain criteria, standards, and procedures be evolved for the guidance of those responsible for rendering the service.

Objectives of Standards

In transporting 4,000,000 children to and from school, it is obvious that every effort must be made to achieve maximum safety in rendering the service. One of the most important factors in achieving safety is the use of a vehicle which meets certain standards of construction. Reasonably safe school buses have been developed by the manufacturers. However, children will be exposed to unnecessary risks as long as some school bus operators are permitted to use home-made wooden buses or others with equally undesirable structural features. The only way in which this can be prevented is for each state to adopt such standards as will require the use for pupil transportation of the safest vehicles the manufacturers know how to build. Agreement among states on national standards will facilitate nation-wide adoption of adequate standards.

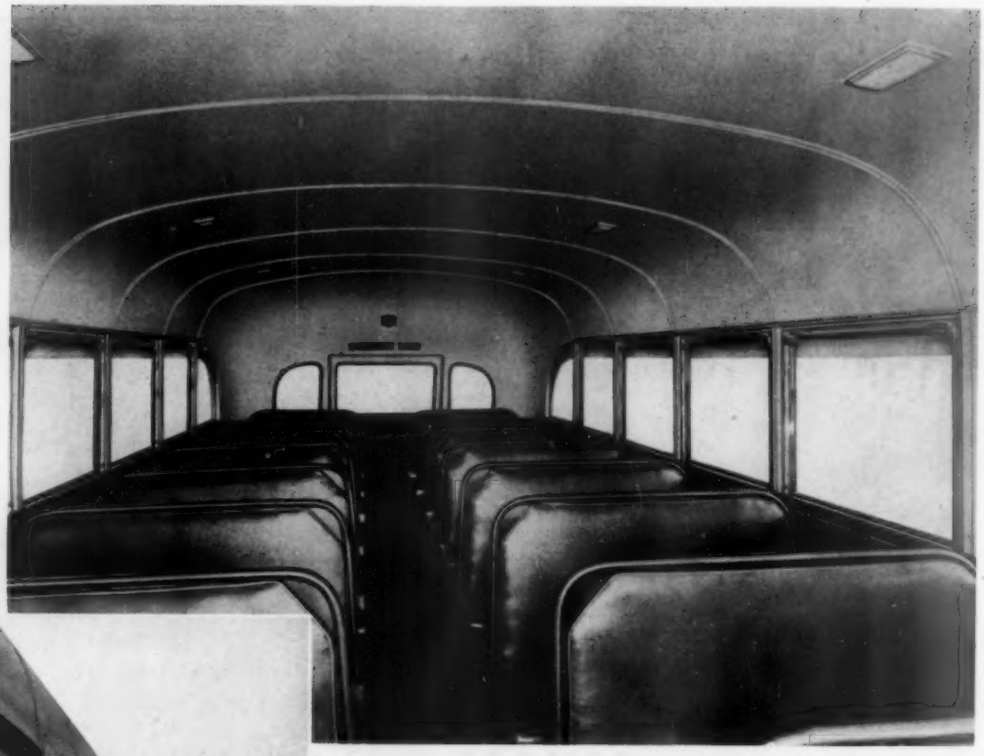
Another important objective in carrying on pupil transportation is economy. Since the service is now costing the public more than $100,000,000 a year, anything which would bring about a saving of even one per cent without crippling the service would be decidedly worthwhile. If each state had its own standards which differed from those of all other states, practically all buses would be custom built. By agreeing on certain fundamental standards most of the buses can be turned out as a part of one mass production job, and the consumer can benefit from the reduction in cost. It would be difficult to make accurate comparisons, but there is no doubt that progress toward nation-wide acceptance of the same standards of school bus construction already has brought about an appreciable reduction in the cost of school buses.

Formulation of Uniform Standards

Prior to 1939 there was no agreement among the states as to what constituted desirable standards for school buses. In fact, there were only 26 states in 1939 which had established reasonably complete standards for school buses, and in many of these they were only recommended and no state agency had authority to enforce them. The standards in these 26 states differed, sometimes only in minor details and

Right and below—Many states require such standards as forward facing seats and a STOP sign

Page facing—Recommended standards and principal features of a bus body





Courtesy of the Hicks Body Company, Inc.

sometimes very widely. There were 11 more states which had established a few standards ranging in number from one to four. Usually when states had only a few standards they were concerned with safety glass and color and usually were a part of the motor vehicle code and enforced by the state police. There were 11 states in which no school bus standards were either recommended or enforced.

The first step toward uniform state standards for school buses was taken in 1939 when a national conference was called to formulate such standards. This conference resulted largely from a survey of pupil transportation conducted at Teachers College, Columbia University, by Dr. M. C. S. Noble, Jr., under the direction of Dr. Frank W. Cyr. This study revealed that many states did not have construction standards for school buses, that there was considerable difference from state to state in the standards which did exist, and that there was a feeling on the part of many state department of education staff members who worked with this problem that such standards should be developed. The conference was sponsored by the National Council of Chief State School Officers, and it was financed by a grant from the General Education Board. It was attended by representatives of all the 48 states; representatives of manufacturers of bus chassis, bodies, and equipment; and by expert technicians who acted as consultants.

The 1939 conference was an important milestone in bringing order out of some of the disorder which had existed in connection with pupil transportation service during its rapid development during the preceding quarter century. Agreements were reached among the conferees on such major problems as standard sizes for school buses; location and size of service and emergency doors, seating arrangements, general construction features; and the use of certain safety devices and features. This made it possible for manufacturers to build school buses according to these specifications and know that they would be acceptable to a large majority of the prospective buyers without radical or expensive changes.

In the six years following the 1939 conference, there was a decided change in the national picture with reference to school bus standards. Several of the states which had standards prior to 1939 changed these where necessary to conform to the national standards. Some of the states which had only a few standards or none at all before 1939 adopted many or all of the new standards. The picture was so changed that, by 1945, only about a half dozen states neither recommended nor enforced school bus standards and an additional half dozen recommended standards but made no attempt to enforce them. This meant that in three-fourths of the states one or more state agencies were enforcing some sort of school bus standards.

In the few years following the 1939 conference, it became obvious that another conference would be desirable within a few years. There was need to strengthen or clarify certain standards. Technological advances made it necessary to change certain standards. There was need, too, for certain standards in addition to those already developed. Because the war had practically stopped for almost four years the manufacture of new buses, and schools were having to get by on buses already in use or others converted to pupil transportation use, it was evident that school buses would be purchased in tremendous volume as soon as they were available. Therefore, immediately after the end of the war seemed a most opportune time for the holding of a second national conference on school bus standards.

The second conference was held at Jackson's Mill, West Virginia, October 29—November 2, 1945. It, too, was sponsored by the National Council of Chief State School Officers. The conference was financed by a grant from the Automotive Safety Foundation and administered by the Commission on Safety Education of the National Education Association. It was attended by representatives of 43 states and by representatives of a large majority of the manufacturers of school bus chassis, bodies, and equipment. Representatives of various federal agencies and national organizations were requested to attend the conference as consultants.

The 1945 conference made few radical changes in the standards approved by the 1939 conference although there were many minor changes. There were some changes in the sizes of buses; the conference approved the use of two buses of greater capacity than those approved by the 1939 conference. An effort was made to improve the signaling devices to be used on buses in order to achieve greater safety in transportation. One of the major accomplishments of the conferences was the development of a set of standards for small buses used to transport 10 to 20 pupils. These will be of great value in those states where large numbers of panel trucks and similar vehicles are converted into small buses.

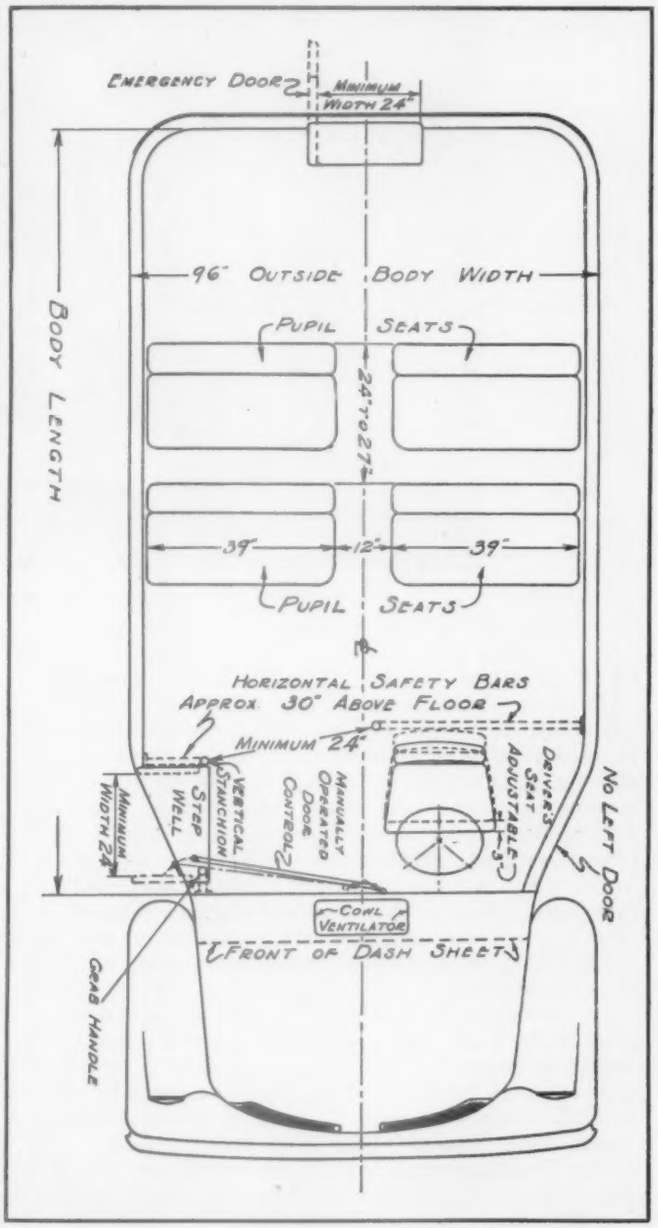
Adopting and Enforcing Standards

Bringing the school bus standards up to date can bring about maximum progress toward the objectives of safety and economy in pupil transportation to the extent that they are put into effect by the 48 states. Since there has been marked improvement in this respect since the 1939 conference, there is no reason to doubt that this improvement will continue. It seems probable that, within another year or two, all of the 48 states will have adopted school bus standards and that in almost all of these states some machinery will have been established for at least some degree of enforcement of these standards.

Different methods of adopting and enforcing school bus standards have been worked out in different states. In almost all states there is a motor vehicle department, or one which discharges similar functions. Many state departments of education have worked out a cooperative relationship with this department to make most effective the application of school bus standards. This seems to be a sound procedure because the motor vehicle department has, in many states, machinery for the inspection of vehicles and for the enforcement of laws and regulations.

It would seem to be a sound procedure to make the requirements for licensing a new school bus include the provision that the vehicle must first be inspected and pass all the state requirements for such a vehicle before a license for its operation is issued. Periodic inspection of all the school buses in the state will make it possible to bring all old vehicles up to the standards as rapidly as practicable and to keep all of the new vehicles in condition to meet the standards at all times.

EDITOR'S NOTE: The National Commission on Safety Education has published the minimum standards for school buses, developed and approved at the Jackson's Mill conference, in a 68-page booklet bound in the "national bus chrome medium," adopted by the conference for all school buses in the United States. The booklet, *School Bus Standards*—1945 Revised Edition, can be secured from the National Education Association, 1201 Sixteenth Street, N.W., Washington 6, D. C. Single copies are 30 cents.



THE SELECTION OF SCHOOL EQUIPMENT AND SUPPLIES

By WALTER D. COCKING

Editor, The American School and University

Courtesy of Board of Education, New York, New York



Enhancement of learning is the only criterion for evaluating equipment

THE equipment and supply problem has four major phases. They are: (1) selection, (2) purchase, (3) management, and (4) use. The generalization can be made that if equipment and supplies are selected efficiently, purchased by using the best business procedures, managed effectively (management includes among other things distribution, care, inventory, and record-keeping), and used with skill by persons trained in the use of a given item, then a system may be said to be administering equipment and supplies in an effective and efficient manner. This discussion will be limited to a consideration of the first factor, namely that of selection.

In these postwar years, the issue of selection of articles for educational use will become of ever-growing importance (1) because little new equipment and supplies were produced during the war years or were available to schools, and (2) because postwar educational needs and the rapidly expanding school and college building program will produce the greatest demand for equipment and supplies which we have ever known. Also, the increasing tempo of technological discoveries and developments is sure to bring to the market many articles and items which are entirely new and which should be substituted for many things formerly used.

Only One Way to Evaluate Items

"What is the function of equipment and supplies in an educational institution?" There can be but one answer. Equipment and supplies are intended to aid in the attainment of educational objectives. There is no room for any piece of equipment or any supply which directly or indirectly does not contribute to this end.

It would be interesting to evaluate the thousands of items of equipment and supplies in educational institutions by this standard. It would be a worthwhile undertaking for any educational unit to make such a study for its system alone. Let us not delude ourselves. In spite of the limited thought which has been given to the equipment and supplies problem, and there can be little question that the school equipment and supplies problem has received scant attention

either from control boards or the operating personnel, these items are important in the attainment of educational goals. There is sufficient evidence available to warrant the conclusion that in those cases where proper equipment and supplies are used the results are worthwhile.

Size of the Equipment and Supplies Problem

Estimates as to the total amount of money being spent by educational institutions for equipment and supplies are inconclusive. The U. S. Office of Education in its official reports indicates approximately 75 million dollars a year is spent for these purposes. When broken down on a per-pupil basis, the average amount spent per pupil per year is approximately $2.50, or from $65 to $75 per classroom. Although the amount spent for this purpose is small in relation to the amount spent for all educational purposes, it is an impressive sum.

One of the difficulties in using available figures lies in the fact that there is no adequate definition of what constitutes a piece of equipment or supply, or what items are figured in the total. For example, some systems include books and instructional supplies; others include operating supplies; some amortize the cost of fixed equipment; while others do not include such items. The situation certainly calls for a more careful definition, and an agreement among school officials on a better classification.

When considered in the light of the number of items involved, the equipment and supplies problem becomes staggering. The average school system or college customarily uses between four and five thousand different pieces of equipment and supplies. Of course, many systems use many more items numbering up to more than ten thousand, while the small institutions use a far smaller number than the average. The important thing to consider, however, is that there are ten thousand or more items available on the market, which some school and college systems use in their programs. Surely, a problem of this magnitude in terms of the amount of money expended and the number of items involved requires careful planning and expert administration. To date it has not received the attention it deserves.

Considerations Involved in Selection

There are a number of considerations involved in the selection of equipment and supplies. Five are set forth here for attention. They are as follows:

1. The standard of quality which the item should meet.
2. Safety, health, and sanitation considerations.
3. Durability, or probable length of life of the item.
4. The extent to which the item requires servicing, and the servicing facilities available.
5. The number of uses to which a given item can be put.

Every school system should set up specifically its standards for each of these considerations to guide those who are charged with responsibility of selecting equipment and supplies. Furthermore, these matters might well receive the attention of national or regional committees, as the fundamental issues will not vary to any extent in the local situation. It is somewhat surprising that they have not received more attention in past years. It is only one further piece of evidence that the whole problem of equipment and supplies has been given insufficient attention by educators.

Who Should Select Equipment and Supplies

Much useless argument has taken place with respect to the question of whose business it is to select equipment and supplies for school use. The proponents of special groups seem to be imbued with the desire for power or official status for the group they favor, rather than with the more basic issue of determining what persons in the system are most capable and best qualified to select equipment and supplies for the system. The criteria which should be applied are (1) does the person (or group) understand most about the activity in which the equipment or supply is to be used? and (2) does the person (or group) understand most about the equipment and supplies available for the purpose?

The title or position of the person who is given the task of specifying equipment and supplies makes little difference. Whether he is a classroom teacher, a janitor, a principal, a supervisor, a board member, or someone else is incidental. What counts is that the person so chosen shall be qualified for the task to which he is assigned. Adherence to the principle of competence rather than caste would do much to increase efficiency in selecting equipment and supplies for our schools.

Procedures in Selecting Equipment and Supplies

When the persons or committees have been chosen who have the necessary qualifications for selecting supplies, there are certain types of procedure which should be followed. Those selecting supplies should (1) be acquainted with the objective standards for judging the quality and effectiveness of the items under consideration and (2) should apply them wherever and whenever possible. The Bureau of Standards, a division of the U. S. Department of Commerce, has done considerable work developing standards for school equipment and supplies. Some of the measures furnish criteria for judging the quality of ink for typewriter ribbons, the tensity of paper, the quality of lead in pencils, etc. In addition, many schools have developed some standards of their own.

Notwithstanding the progress that is being made, objective standards are not yet available for many items. National and regional committees, as well as local groups, may well give this problem further attention. Collaborating committees of manufacturers and consumers may well prove to be of assistance in securing better standards.

The application of objective standards is not the only factor in choosing a given equipment or supply item. Judgment is highly important. It is here that the experience and understanding of those charged with the responsibility comes in. Also vital is open-mindedness, or what might be called the judicial attitude. A person selecting equipment and supplies should always be in the learning attitude. His mind should not be made up in advance. He should consider each particular item in the light of the purpose it is to attain.

Many claims are made by manufacturers and users for articles which are yet to be tested. Scientific ex-

perimentation, which would be of material assistance to those charged with the responsibility of selecting the best equipment and supplies for school use, is only possible when selection is made a continuous process throughout the year rather than over a brief intensive period. Much experimentation could be conducted on a national basis.

Closely allied to experimentation is demonstration. Those charged with the selection problem would be aided greatly if they could observe the use of a particular article in actual practice and for specific purposes. Such demonstrations could be conducted by the manufacturer of the product, or by the user, or by both.

Price and Selection

Until a decision has been reached on what item can best achieve the purpose, a consideration of price should not enter the selection picture. This should not be construed as considering price of little or no importance. It simply presents the issue of price in its proper place.

Sometimes, when an inferior but cheaper article is used, we find that the cost is much higher in the long run than if an article requiring a greater initial outlay but of better quality had been selected. At the same time, it is equally true that in many cases items are selected which are of a better quality than a given use requires, and hence money is spent foolishly. When several articles will achieve the purpose for which they are being considered about equally well, there is every reason why the one which is lowest in price should be selected. When the difference in the efficiency of the article for the job to be done is not sufficient to justify a difference in cost, then the price of the article becomes a factor in selection.

The conclusion is that the price of a given item of equipment or supplies should always be secondary and never primary. The factor of efficiency in getting a job done should always receive first consideration.

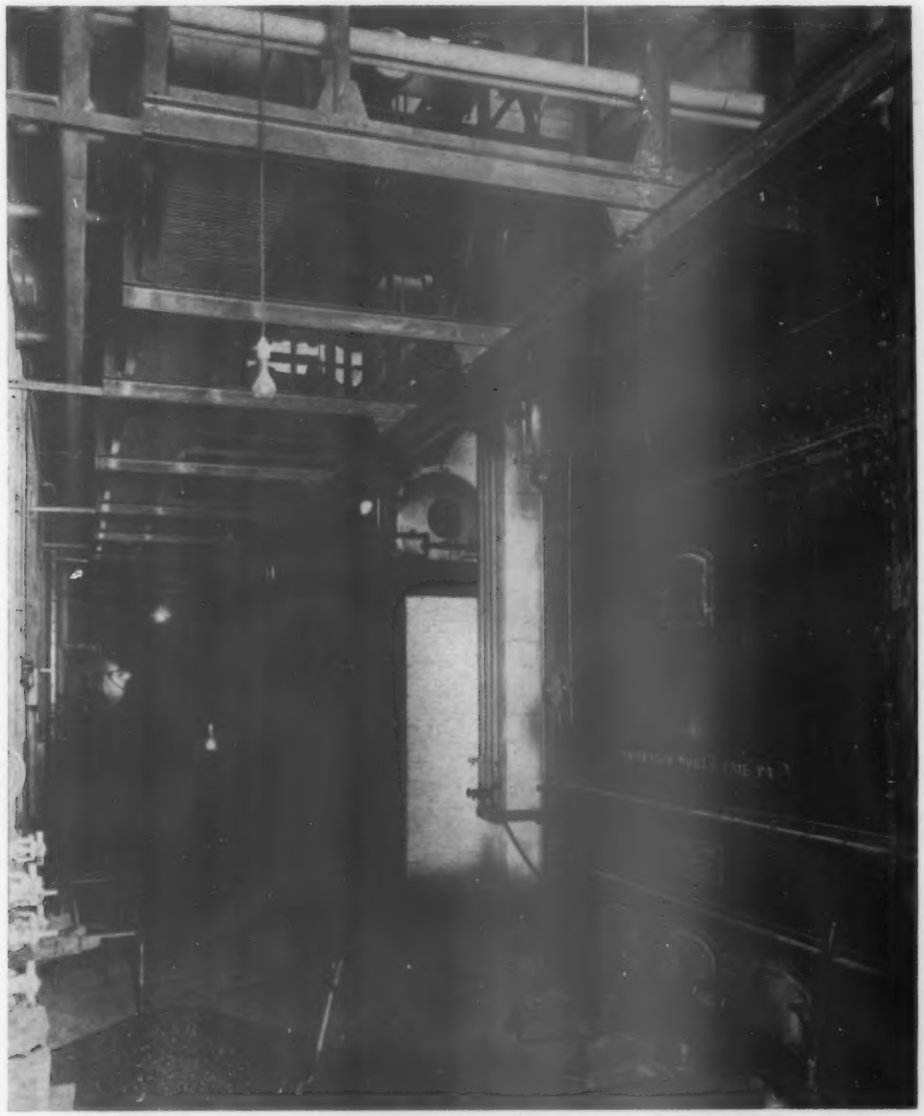
Selection Committees

Returning to the problem of who should be chosen to select equipment and supplies, or what groups should be involved in some phase or phases of selection, the following groups should be included: (1) teachers and operating personnel, (2) principals and supervisors, (3) business officials, (4) technicians, (5) superintendent of schools, (6) board of education.

While it should be re-emphasized that title or position is unimportant in the make-up of the group selecting the articles, and that those should be chosen for the job who have the best qualifications for it, nevertheless, representatives of various groups ordinarily are the best qualified to select certain types of items. Classroom teachers, principals, and supervisors know most about equipment and supplies for instructional purposes. Janitors, engineers, and superintendents of buildings know most about operational equipment and supplies. Sometimes, a particular person will have



Classroom teachers should be consulted on purchases of equipment and supplies for instructional purposes



"... a first-grade teacher would not be expected to know how to judge BTU units of coal"

special abilities for a particular job. When such is the case, advantage should be taken of it. Ordinarily, however, people who do not have close relationship to a given activity have little value on a committee which has the responsibility of selecting equipment and supplies for that activity.

For instance, a music teacher ordinarily would not be well qualified to select a clock system; a janitor probably would not know too much about selecting a compound microscope; a stenographer would not be too helpful in choosing the best heating system; a certified public accountant would not be qualified to select maps and globes; a first-grade teacher would not be expected to know how to judge BTU units of coal.

Because of the great diversity in the types and kinds of equipment used in a school system, no one committee or a single individual can be expected to select all items. Many committees are necessary.

One thing is obvious. No superintendent of schools or college president can be expected to select equipment and supplies for his entire system efficiently or effectively. No one individual can possibly know the technical aspects of much of the equipment and supplies needed in a modern school system. And yet many urge that the superintendent of schools should do all of the selecting. The idea is unthinkable. It is even more ridiculous to expect a lay board of education to have competence for such selection. Both the chief administrator and the board of education which would select equipment and supplies efficiently for the system for which they are responsible must depend as a matter of course upon those in their system who have the greatest competence with respect to the various tasks involved in the selection of proper equipment and supplies. In this way, rather than through personal selection, the superintendent and board of education operate effectively in the discharge of their responsibility for the selection of the best equipment and supplies.

Steps in Selection

Finally, what are the steps which must be taken in the selection of educational equipment and supplies

and by whom should these steps be carried out?

1. *Determination of need.* Need should be determined primarily by those who are competent in the performance of the given activity.
2. *Listing of possible articles which may meet the need.* This task can best be done by those who are to carry out the activity in question.
3. *Exhibit of the possible items listed.* Ordinarily manufacturers are glad to provide samples or will make suitable arrangements for their articles to be seen.
4. *Test (both subjective and objective) of the articles considered to determine the extent to which the articles meet the need.* This is a task which can best be performed by the ultimate user of a given item and by technicians especially trained in their use who may be found either within or without the school personnel.
5. *Rating of the items in order of their efficiency in meeting the need.* This again is a task for the ultimate user of the article, aided and advised by special technicians.
6. *Comparison of prices of the first three or five items having the highest ratings.* This task is one which can be performed by the business personnel of the system.
7. *Recommendation to the central office.* This task is the final job of the original committees on selection.
8. *Review of recommendations of the selecting committees.* Here the superintendent if he has an officially constituted administrative council may make use of their advice and assistance. In the absence of such a council, the superintendent may find it advisable to appoint a special reviewing committee selected from the entire personnel because of their superior judgment and competence.
9. *Acceptance of the final recommendations* and approval by the superintendent.
10. *Recommendation of the articles selected to the board of education,* which, of course, is the responsibility of the superintendent of schools.
11. *Consideration of the recommendations and approval* by the board of education.

When these steps have been taken, the problem of selection of any given article can be said to have been completed. And then remains the determination of the amount of each item to be purchased; the purchasing procedure; the receipt, housing, and payment of the articles; their distribution to the place of use; and finally, the use of the article in the activity for which it was selected.

Conclusions

Certain conclusions seem justified in the light of the foregoing discussion.

1. The direct responsibility for the selection of educational supplies and equipment should be lodged in the superintendent or someone responsible to him. Actual selection should be made by those who are to use this equipment.

2. The kind, quantity, and quality of all equipment and supplies, in any school system, should be justified from the standpoint of improvement of instructional or operational services.

3. A continuous program of controlled experimental studies, having as its objective the scientific determination of quality and quantity of supplies and equipment required, should be undertaken.

4. There should be a standardized list of supplies and equipment available, which should be subject to annual revision.

5. The quality of the material should not be in excess of that which will meet the specific need; neither should it be below such standards.

6. Expenditures for supplies and equipment should be in strict accordance with budgetary policies.

7. A periodical inspection of the classrooms and individual school storage rooms should be made to see that supplies and equipment are being properly and economically used.

8. As soon as any supply or equipment becomes unnecessary, it should be returned to the warehouse or storeroom.

9. Hoarding of supplies and equipment should be guarded against.

10. Sufficient notice of contemplated change in any equipment or supplies should be given to permit supplies on hand to be used up before changes are made.

11. Equipment and supplies should be kept in proper repair at all times, and all means should be used to prevent any deterioration.

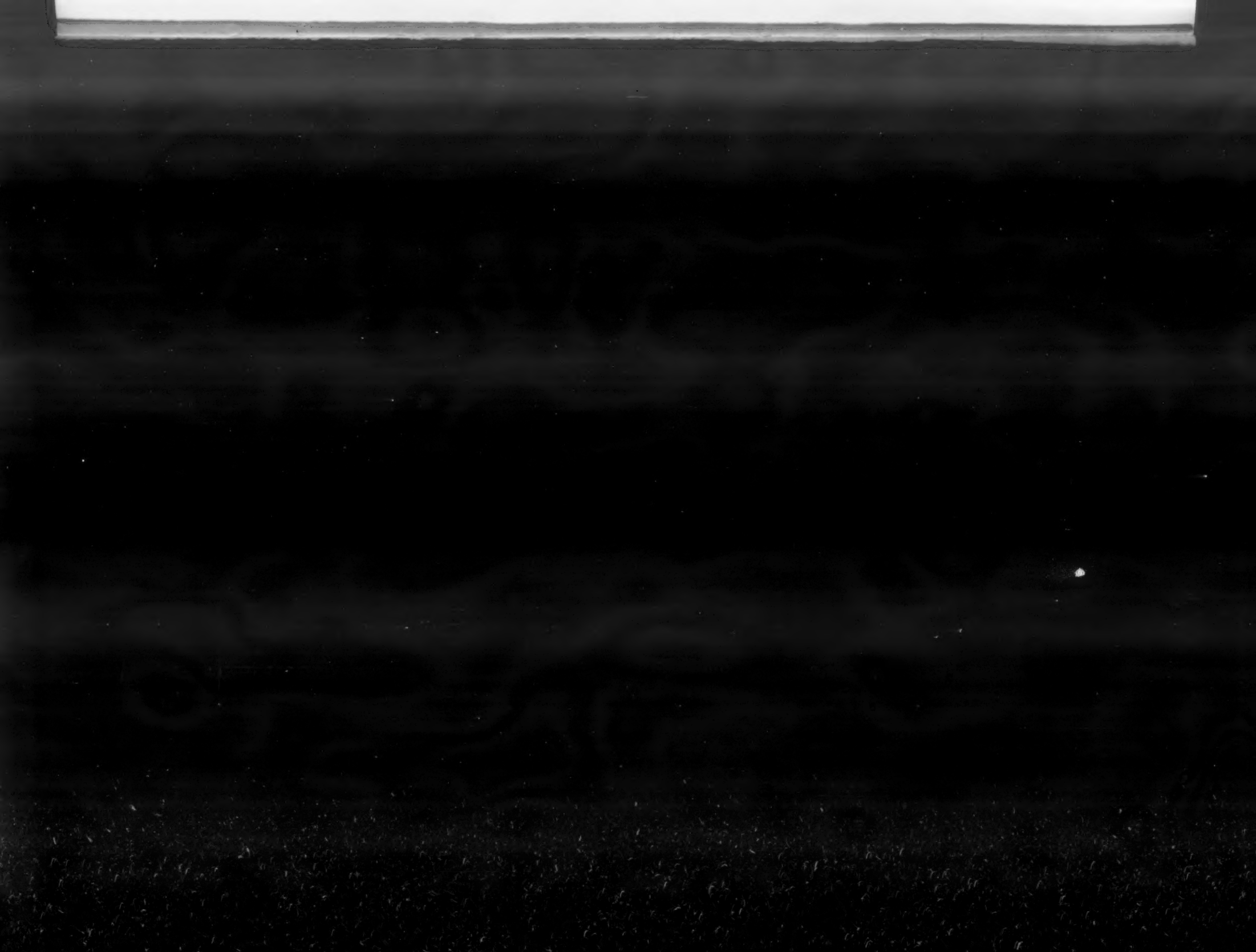
12. Supplies and equipment should be selected at such times as will avoid all delay in purchasing, delivery, and distribution, and so permit of the greatest service.

13. The purchasing agent should keep an up-to-date file containing names of all reliable vendors handling the various items.

14. When bids have been opened and tabulated, consideration should be given in each case to the lowest and best bidder, quality and service considered.

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1,639,930 August 23, 1927
1,783,958 December 9, 1930
1,795,331 March 10, 1931
1,891,346 December 20, 1932
2,021,480 November 19, 1935
2,031,937 February 25, 1936
2,211,848 August 20, 1940
2,376,906 May 29, 1945

Canadian Patents

329,165 January 10, 1933
331,206 March 28, 1933

Great Britain Patents

382,138 January 18, 1932

Other patents pending

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Location: Cambridge, Mass.
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Owner: President & Fellows of Harvard College

Radio Research Laboratory
Location: Cambridge, Mass.
Architects: Coolidge, Shelley, Bulfinch & Abbott
Owners: Harvard University

Hemenway Building Addition
Location: Cambridge, Mass.
Architect: Coolidge, Shepley, Bulfinch & Abbott
Owner: President & Fellows of Harvard College

Freshman Dormitories
Location: Cambridge, Mass.
Architect: Shepley, Rutan & Coolidge
Owner: Harvard University

McKinlock Dormitory
Location: Cambridge, Mass.
Architect: Coolidge, Shepley, Bulfinch & Abbott
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Location: Cambridge, Mass.
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YALE UNIVERSITY

Institute of Human Relations
Location: New Haven, Conn.
Architect: Grosvenor Atterbury, John Tompkins Assoc.
Owner: Yale University

Sterling Hall of Medicine (Library Wing Addition)
Location: New Haven, Conn.
Architect: Chas. Z. Klauder
Owner: Yale University

PRINCETON UNIVERSITY

Laboratory of Physics
Location: Princeton, N. J.
Architect: H. J. Hardenbergh
Owner: Princeton University

Palmer Stadium
Location: Princeton, New Jersey
Architects: McKim, Mead & White
Owner: Princeton University

CORNELL UNIVERSITY

Myron Taylor Hall
Location: Ithaca, N. Y.
Architect: Jackson, Robertson & Adams
Owner: Cornell University

COLUMBIA UNIVERSITY

School of Journalism
Location: New York City
Architect: McKim, Mead and White
Owner: Trustees of Columbia College



SCHOOL OF GEOGRAPHY
HARVARD UNIVERSITY, CAMBRIDGE, MASS.

PURDUE UNIVERSITY

Music Hall—Purdue University
Location: Lafayette, Ind.
Architect: Walter Scholer
Owner: Trustees of Purdue University

Residence for Men—
Location: Lafayette, Ind.
Architect: Walter Scholer
Owner: Trustees of Purdue University

Chemical Engineering Laboratory
Location: West Lafayette, Indiana
Architect: Walter Scholer
Owner: Purdue University

WELLESLEY COLLEGE

Wellesley Temporary Hall
Location: Wellesley, Mass.
Architect: Shepley, Rutan & Coolidge
Owner: Wellesley College

Central Dormitory
Location: Wellesley, Mass.
Architect: Coolidge & Carlson
Owner: Wellesley College

GEORGETOWN UNIVERSITY DORMITORIES

Location: Washington, D. C.
Architect: Marsh & Peters
Owner: President & Directors of Georgetown University

DUKE UNIVERSITY—TRINITY COLLEGE — (11 buildings, incl. Auditorium, Library, Dormitories, Class Room Buildings, Laboratory)

Location: Durham, N. C.
Architect: Horace Trumbauer
Owner: Duke University

UNIVERSITY OF MICHIGAN

Martha Cook Dormitory
Location: Ann Arbor, Mich.
Architect: York & Sawyer
Owner: University of Michigan

Chi Psi Fraternity Building
Location: Ann Arbor, Mich.
Architect: York & Sawyer
Owner: Epsilon Realty Company

GEORGE A. FULLER COMPANY

BUILDING CONSTRUCTION *(Continued)*

UNIVERSITY OF PENNSYLVANIA
Zoological Laboratory
Location: Philadelphia, Pa.
Architect: Cope & Stewardson
Owner: University of Pennsylvania

UNIVERSITY OF ALBERTA
Edmonton Arts
Location: Edmonton, Alberta, Canada
Architect: Nobbs & Hyde
Owner: Board of Governors, University of Alberta

UNIVERSITY OF TORONTO
Mill Building Addition
Location: Toronto, Canada
Architect: Craig & Madell and T. R. Loudon
Owner: Governors of the University of Toronto



CARDINAL HAYES MEMORIAL HIGH SCHOOL
BRONX, NEW YORK CITY

SIMMONS FEMALE COLLEGE
Location: Boston, Mass.
Architect: Peabody & Stearns
Owner: Simmons Female College

ARTILLERY SCHOOL
Location: Norfolk, Va.
Architect: F. B. Wharton, Q.M. Dept.
Owner: War Department, U. S. A.

ST. MICHAELS COLLEGE
Location: Toronto, Canada
Architect: Arthur W. Holmes
Owner: St. Michaels College

CATHEDRAL DORMITORY GYMNASIUM
Location: Washington, D. C.
Architect: A. B. Heaton
Owner: Protestant Episcopal Cathedral Foundation of D. C.

COLLEGE OF PREACHERS
Location: Washington, D. C.
Architect: Frohman, Robb & Little
Owner: Protestant Episcopal Cathedral Foundation of D. C.

McKINLEY SCHOOL
Location: Washington, D. C.
Architect: L. Norris
Owner: District of Columbia

MT. PLEASANT SCHOOL
Location: Washington, D. C.
Architect: Marsh & Peters
Owner: District of Columbia

MT. ALTO SCHOOL
Location: Washington, D. C.
Architect: Charles Francis Wood
Owner: National School Domestic Arts & Sciences, Inc.

BROOKINGS SCHOOL
Location: Washington, D. C.
Architect: Waddy B. Wood
Owner: Robt. Brookings Graduate School of E. & G.

IMMACULATE CONCEPTION SCHOOL
Location: Newburyport, Mass.
Architect: The Immaculate Conception Parish
Owner: The Immaculate Conception Parish

PUBLIC LATIN SCHOOL
Location: Boston, Mass.
Architect: James E. McLoughlin
Owner: City of Boston

NEWBURYPORT HIGH SCHOOL
Location: Newburyport, Mass.
Architect: Edwin S. Dodge
Owner: City of Newburyport

GOOD SHEPHERD SCHOOL ADDITION
Location: New York, N. Y.
Architect: Paul Monaghan
Owner: Corp. of R. C. Church of the Good Shepherd of N. Y.

CARDINAL HAYES MEMORIAL HIGH SCHOOL
Location: New York, N. Y.
Architect: Eggers & Higgins
Owner: Archbishopric of New York

GIRLS' COMMERCIAL HIGH SCHOOL
Location: Brooklyn, N. Y.
Architect: William H. Gompert
Owner: Board of Education of City of New York



SPENCE SCHOOL
Location: New York City
Architect: Office of John Russell Pope
Owner: Trustees of the Miss Spence School, Inc.

VANDERLIP SCHOOL AND LIBRARY
Location: Scarborough, N. Y.
Architect: W. W. Bosworth
Owner: F. A. Vanderlip

DOBBS FERRY HIGH SCHOOL
Location: Dobbs Ferry, N. Y.
Architect: Knappe & Morris
Owner: Board of Education, Town of Greenburgh, N. Y.

BALDWIN SCHOOL GYMNASIUM
Location: Bryn Mawr, Pa.
Architect: Fuller Industrial Engineering Co.
Owner: Baldwin School, Inc.

BOYS' LATIN SCHOOL
Location: Cleveland, Ohio
Architect: Edward T. P. Graham
Owner: Bishop of Cleveland

HIGH SCHOOL
Location: Montreal, Canada
Architect: Edward & W. S. Maxwell
Owner: Protestant Board of School Commissions

NORMAL SCHOOL
Location: Boston, Mass.
Architect: Peabody & Stearns, Coolidge & Carlson, and Maginnis, Walsh & Sullivan
Owner: City of Boston

WENTWORTH INSTITUTE (East Wing)
Location: Boston, Mass.
Architect: Peabody & Stearns
Owner: Wentworth Institute

SPRINGFIELD TRADE SCHOOL
Location: Springfield, Mass.
Architect: Gardner & King
Owner: City of Springfield

NAVAL TRAINING STATION
Location: Hingham, Mass.
Architect: Public Works Office
Owner: U. S. Government

MARINE BIOLOGICAL LABORATORY
Location: Woods Hole, Mass.
Architect: Coolidge, Shepley, Bulfinch & Abbott
Owner: Marine Biological Laboratory

RINDGE TECHNICAL SCHOOL
Location: Cambridge, Mass.
Architect: Ralph Harrington Doane
Owner: City of Cambridge

WILLIAM L. CROW CONSTRUCTION COMPANY

ESTABLISHED 1840

101 Park Avenue, New York City

ONE hundred and six years ago our company was founded to serve the needs of a rapidly growing nation. Our firm is older than most of the buildings now standing throughout the country. We are proud of our age. For our founders placed their faith in efficient management, carefully trained personnel, honest business practices and progressive planning for the future, and we are gratified to know that these fundamentals have successfully carried us through more than a century of booms, depressions, panics and wars.

THOUGH we have grown and expanded with our country, these same fundamentals have remained an integral and unchanging part of the Crow Construction Company. And today we are able to offer our clients the benefit of these time-tested principles in addition to the most up-to-date technical skill and knowledge.

OUR INSTITUTIONAL CLIENTS INCLUDE: *Rensselaer Polytechnic Institute*

New York Institute for the Education of the Blind

Society of Promotion, Religion and Learning, New York *Carnegie Library*



The Ricketts Aeronautical Laboratory-Rensselaer Polytechnic Institute, Troy, N. Y.

Joseph M. Lawlor, Architect

DURING the long period of our building activity we have been privileged to construct a wide variety of buildings for a great many distinguished organizations and institutions. We are particularly proud of our record of service to educational clients, a few of whom are listed below. Our extensive experience with this type of work has equipped us to serve you to your complete satisfaction.

Masters School, Dobbs Ferry, N. Y.

Marymount College, Tarrytown, N. Y.

St. Francis Xavier College, New York

New York Public Library

Concordia College, Bronxville, N. Y.

Cathedral House, Garden City, N. Y.

TRAFFIC & STREET SIGN COMPANY

Flag Poles Made of Steel, Copper-Bearing Steel, Stainless Steel, Bronze and Aluminum

78 Foundry Street
Newark, N. J.

FLAG POLE SELECTION

Owing to our many years of experience in handling floodlight, sign, radio or flag pole problems of all kinds, we are able to offer architects and school officials a well-rounded service in planning, detailing and specifying the flag pole and equipment best suited to each individual installation, with due regard to the location factor and to budget limitations.

Our flag poles are made of steel, copper-bearing steel, stainless steel, bronze, aluminum or magnesium. A wide choice of steel flag poles is offered: continuous tapered poles in two types, and telescoped sectional poles in three types—standard, heavy and extra heavy. The flag poles may be ground set, with or without base; roof set, with braces or penetrating roof; or wall set, with a wide variety of supports. We have an unusually wide selection of stock bases, and shall be glad to forward sketches of them. Complete catalog will be sent on request. We are also equipped to fabricate special bases in accordance with architects' sketches.

We suggest that rough sketches of contemplated flag poles be submitted to us, in order that we may prepare details, specifications and estimates. All services offered are, of course, without charge or obligation.



Bloomfield Junior High School
Bloomfield, N. J.

SAFETY NOTE

School architects and purchasing officials are urged to investigate the advantages for safety of steel as opposed to wood in flag pole construction. Wood poles, which to all outward appearance are in good condition, may have rotted inside to a point where they may become the victim of the next strong wind. Furthermore, a good steel flag pole close to a building is an excellent protection against lightning. A steel pole not only safeguards the adjacent structure, but can also be struck by a bolt without danger or collapse.

THE IDEAL WAR MEMORIAL

What more fitting war memorial can be conceived for the school's heroes than a straight tall flag pole, with a plaque at the base commemorating their names and deeds? To those interested in a flag pole memorial plaque, we shall be glad to submit sketches.

THE "CADET" FLAG POLE

The "Cadet" Flag Pole meets the demand for a continuous tapered pole of light weight at a cost within the reach of the small school budget. It has the same construction and proportioning as our standard continuous straight tapered poles, but the height is reduced to forty feet, permitting reductions in wall thickness and weight without sacrificing strength and safety. The "Cadet" gives trouble-free service under all conditions, and is guaranteed to withstand a wind pressure of ninety miles an hour.

CATALOG

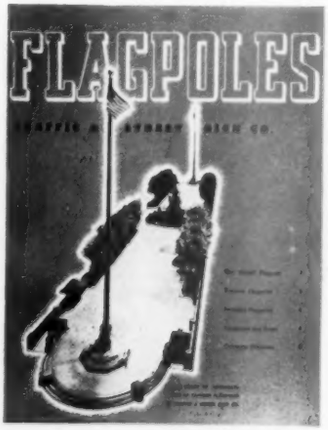
The booklet illustrated below was prepared for the express purpose of simplifying the selection and purchase of the right flag pole for any given building or property. A letter or post-card will bring you your copy by return mail.

★

OTHER PRODUCTS

"Slow," "Caution," "School Zone" signs, parking regulation signs, posts and standards for all types of signs, radio poles, floodlighting poles, etc., are included in the *Traffic and Street Sign Company* line of manufactures. For further information on any of these products, consult *Sweet's Catalog*.

★



JOHN E. LINGO & SON, INC.

ESTABLISHED 1897

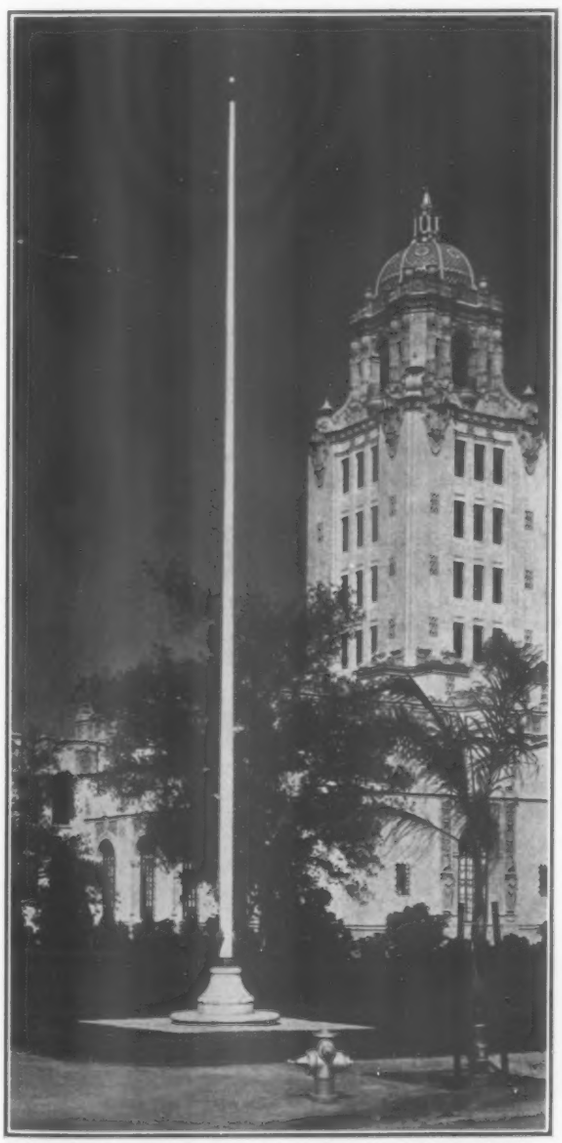
Manufacturers of
Metal Flagpoles
29th Street & Buren Avenue
Camden, New Jersey

Telephone: CAMDEN 0487

FLAGPOLES BY LINGO SINCE 1897

FOR SCHOOLS, COLLEGES, PARKS, PLAYGROUNDS, WAR MEMORIALS AND STADIA

AFTER nearly four years of War Production of tubular steel products for the Armed Forces, unlimited manufacture of Lingo Metal Flagpoles has been resumed and we are now in a position to fulfill your requirements with the same high quality product, designed, constructed and delivered in the same efficient Lingo manner. Our flagpoles are made for every conceivable type of installation in any suitable metal desired and in various lengths from 8 feet to 200 feet. Lingo is responsible for nearly all the modern refinements in existence today by experience gained from thousands of flagpole installations embracing every Continent throughout the world.



50 Feet Above Grade, Continuous Straight Tapered Heavy Type Steel Flagpole, City Hall, Beverly Hills, Calif.

TWO DISTINCT TYPES OF STEEL FLAGPOLES AVAILABLE FROM STOCK

Continuous Straight Tapered Steel Flagpoles (illustrated in cut and photo at left) are carried in stock and are standardized in lengths from 20 feet to 200 feet; have a smooth uninterrupted exterior surface throughout, without visible joints or offsets, and resemble a finished wood flagpole in appearance. Swaged Sectional Steel Flagpoles (illustrated at right) are standardized in lengths from 15 feet to 200 feet; fabricated in sections of standard weight pipe with hydraulic die-swaged telescoped and shrunk joints, made without the use of bolts, rivets, pins, screw couplings, lead calking, etc.

OTHER FLAGPOLE PRODUCTS

Continuous Entasis Tapered Flagpoles, made in steel, bronze, aluminum, nickel silver, stainless steel, etc., are especially suitable for war memorials and buildings of exceptional architectural value. These poles are constructed with true Venetian Entasis and represent the ultimate in modern flagpole designing.

CONSULTATION SERVICE

We welcome the opportunity to study your flagpole problems. Our staff of construction specialists will offer suggestions, prepare details, draw up specifications and estimate entire cost for you, without charge or obligation whatsoever, for the best suited flagpole within your budget. Helpful information for your present and future planning is contained in our 12-page illustrated pamphlet a copy of which is yours for the asking.

WESTERN WATERPROOFING COMPANIES

Waterproofing and Weatherproofing Contractors and Engineers

PENNSYLVANIA CORPORATION
PHILADELPHIA 7, PA., Liberty Trust Building
SCRANTON, PA., 711 Linden Street
BALTIMORE, MD., 308 Baltimore Life Building
WASHINGTON, D. C., 1427 Eye Street, N. W.

NEW YORK CORPORATION
NEW YORK 17, N. Y., Graybar Building
BOSTON 18, MASS., 82 W. Dedham Street

MICHIGAN CORPORATION
DETROIT 26, MICH., Murphy Building
CLEVELAND 15, OHIO, Builders Exchange
TORONTO 2, ONT., 67 Carlton Street
MONTREAL 25, QUE., Keefer Building

OHIO CORPORATION
CINCINNATI 2, OHIO, 401 Schmidt Building
INDIANAPOLIS, IND., 804 Lemcke Building
DAYTON, OHIO, 494 Commercial Building

CHICAGO AND SURROUNDING TERRITORY
CHICAGO 2. ILL., Central Ironite Waterproofing Co., Conway Building

The above mentioned companies are independent corporations and have no financial responsibility for each others acts

IRONITE
Below Grade Waterproofing

For Basement Walls and Floors
Tunnels, Sewers, Pools and Tanks

IRONITE—WHAT IT IS—"GENUINE IRONITE" is composed of over 90% chemically pure iron, pulverized and carefully graded, plus an activating agent. This agent oxidizes the iron particles in the presence of water causing them to swell and lock themselves mechanically in the pores of leaking masonry (brick, stone, concrete) walls and thoroughly and permanently seal the masonry walls against the passage of water. "IRONITE" has been in continuous use for over 35 years.

Trade Mark—The "IRONITE" Trade Mark is owned by the Ironite Company of Chicago, territorially licensed for use to the various Western Waterproofing Corporations.

ADVANTAGES—The Westen Waterproofing Companies' IRONITE Waterproofing Method has outstanding advantages over other types.

(1) IRONITE is usually applied, under ideal working conditions, to the inside of masonry basement and similar walls after erection. It can be readily and inexpensively repaired in case of structural cracks or breaks of any kind without the necessity of excavating. Unlike membrane waterproofing, IRONITE, in the process of oxidation, fills the pores of the masonry walls and becomes a hard, finished integral part of the structure requiring no protection against abrasive injury.

(2) It can be applied to either a wet or dry surface.

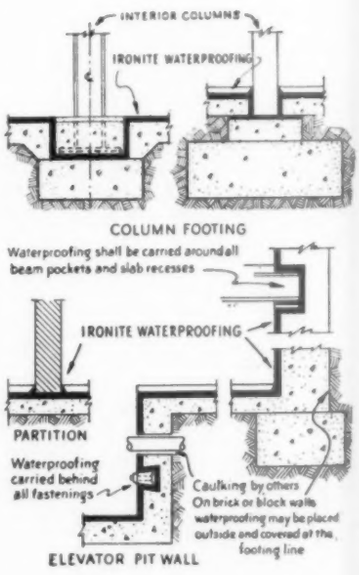
(3) Its application will resist any hydrostatic pressure which the structure itself is capable of withstanding.

(4) Eliminates the necessity of maintaining open-work space trenches and dust dry working conditions for application.

(5) IRONITE Waterproofing is permanent, increasing in hardness with age. It actually lasts as long as the structure itself.

(6) It is equally adaptable to new or existing structure.

ENGINEERING SERVICES—Each waterproofing problem requires individual solution. The Western Waterproofing Companies, with over 30 years of successful waterproofing accomplishment, maintain, in the various territories served, competent waterproofing engineers for consultation and advice. Estimates and detailed specifications applicable to the specific work will be cheerfully furnished.





GENUINE IRONITE is applied only under contract by Western Waterproofing Companies' experienced workmen—no material is for sale. All work is fully guaranteed.

WESTERN WATERPROOFING COMPANIES

Waterproofing and Weatherproofing Contractors and Engineers



Brick joints waterproofed and weatherproofed with RESTO CRETE

Prevents Moisture Damage—Restores and Decorates Exposed Masonry

RESTO-CRETE
Above Grade Weatherproofing



BEFORE and AFTER RESTORATION



RESTO-CRETE—WHAT IT IS—RESTO-CRETE Grout, a product of many years of research and field proven durability, is a protective and decorating weatherproof coating composed of cementatious materials plus certain admixtures and colors. The standard 7-day compressive strength test of the base material is over 3,200 lb. per sq. in. **Absorption in boiling water compared to normal Portland grout is very low, being less than 7% in 24 hrs.** Technical data is available.

Trade-Mark—The "RESTO-CRETE" Trade Mark is owned by the Western Waterproofing Company of Detroit, territorially licensed for use to the various Western Waterproofing Corporations.

TYPES OF WORK—The following types of work have been successfully weatherproofed and/or restored by us under our guarantee of satisfaction. Lists and data of accomplishment furnished on request:

Old Concrete—Buildings of all types, abutments, dams, chimneys, piers, elevators, etc. Sand-blasted as required, chipped; patched with IRONITE Mortar; plastered as required. Finished with RESTO-CRETE to prevent water penetration and to decorate.

New Concrete—Surface plastered smooth or left rough as desired. Finished with one or two coats of RESTO-CRETE.

Swimming Pools—Waterproofed with IRONITE and plastered from rough concrete. Special non-peeling, glossy decorative treatments in white or colors.

Plaster and Stucco—Complete repair of broken areas, using special high-strength plaster. Finished with one or two coats of RESTO-CRETE.

Cinder, Concrete, Haydite, Etc., Block Surfaces—Federal housing jobs, residences, etc. Two coat treatment leaving rough or plaster-like smooth texture. (We believe it the most durable, weatherproof treatment in existence.) Economical and effective.

Brick, Stone Walls—Where only joints leak, hollow and defective joints repointed, then all joints surface-grouted with RESTO-CRETE. Less expensive than a first quality repointing job, and fully as effective. Where both brick and stone leak, entire surface treated without marring the architectural effect. Where stone surface is disintegrated, it is completely rebuilt to original contours and resurfaced.

Cast (Artificial Stone and Terra Cotta)—Complete resurfacing by special patching, thin plastering operations. Finished with RESTO-CRETE to look like new Limestone.

ENGINEERING SERVICES—The Western Waterproofing Companies in the various territories maintain experienced Weatherproofing and Restoration engineers for consultation and advice. Special problems in insulation, acid and alkali proofing, etc., are handled from our well-equipped research laboratories in Detroit. Submission of difficult problems for solution is welcomed.

RESTO-CRETE treatments are applied only under contract by Western Waterproofing Companies' experienced workmen—no material is for sale.

RESTO-CRETE SYSTEM

THE BARRETT DIVISION

ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

2800 So. Sacramento Avenue
Chicago 23, Ill.

Birmingham
Alabama

PRODUCTS

Roofing Materials—For Flat Surfaces: Barrett Specification* Pitch and Felt Roofs, Black Diamond* Pitch and Felt Roofs. Tarred and Asphalt Saturated Felts and Fabrics, Coal-Tar Pitches, Asphalt Cements, etc.

For Steep Surfaces: Barrett Steep Roof Pitch and Felt Roofs, Anchor* Asphalt and S.I.S.* Roofing. Barrett Asphalt Shingles and Roll Roofings.

Miscellaneous—Waterproofing for foundations, swimming pools, tunnels, floors, etc., special specifications submitted. Roof Coatings and cements for general roof repair and maintenance—protective paints. Rock Wool Insulation, Insulating and Building Papers, for sheathing, lining, etc. Dampproofing and plaster bond Coatings, Wood Preservatives. Tarvialithic* for playground surfacing, roadways, paths and tennis courts. Roof Drain and Vent Connections.

For complete information about these and other products, write The Barrett Division, 40 Rector Street, New York 6, N. Y.

THE WORLD'S MOST FAMOUS ROOF

No roof is safer than a Barrett Specification Roof. These famous roofs take Fire Underwriters' Class A rating. Their gravel or slag surface is immune to fire hazards caused by flying sparks and embers (a fact strikingly demonstrated over and over again during the war).

* Reg. U.S. Pat. Off.

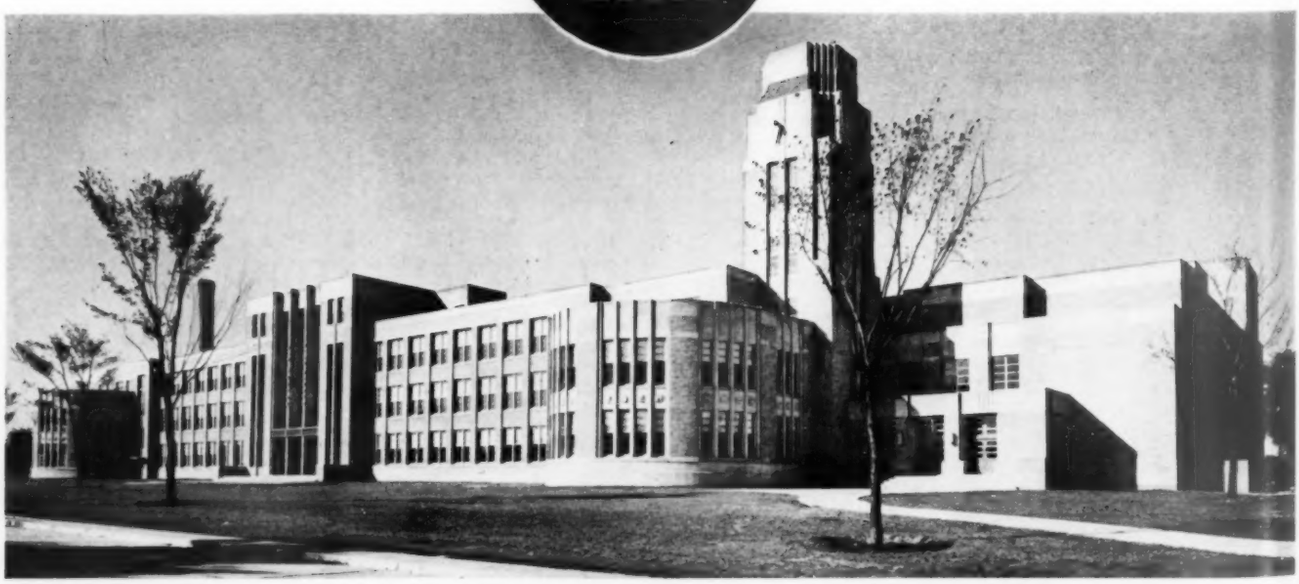
Barrett Specification Roofs are also completely waterproof, thanks to their alternate layers of tar-saturated felt and coal-tar pitch—for pitch is one roofing compound that is actually preserved by water! They are applied by Barrett Approved Roofers, who have been carefully selected on the basis of their experience, ability, and business integrity. The roofs are bonded for periods up to 20 years against repair and maintenance expense, and are built to last for years beyond the terms of their bonds.

These are some of the reasons why Barrett Roofs are so regularly selected for America's finest school buildings. In a nation which is particularly careful of its children, no other roof so completely meets all requirements. Consult with us or your local Barrett Approved Roofer on any roofing or waterproofing problem.

ROOF INSPECTION FREE

For many years, The Barrett Division has offered building owners an unique service that has been the means of saving many thousands of dollars in upkeep expenses. On request, a Barrett Roof Inspector will make a careful survey of your roofs, flashings, copings, parapets, etc., and render a complete unbiased report. This service is free on buildings with roof areas of 5,000 square feet and up, located east of the Rockies.

Barrett ROOFS



The J. W. Sexton High School, Lansing, Michigan, is protected with a Barrett Roof, Barrett Bonded Flashings and Holt Drains. Arch.: Warren S. Holmes Company, Lansing, Michigan; Gen'l Cont.: Charles R. Wermuth & Son, Inc., Fort Wayne, Ind. Rfg. Cont.: Lansing Roofing & Insulating Company.

THE PHILIP CAREY MFG. COMPANY

General Offices: Lockland, Cincinnati 15, Ohio

Manufacturers of Asphalt, Asbestos and Magnesia Building Products

Carey **Built-Up Roofing . . . Asphalt Shingles . . . Asbestos Cement Products . . .**
Rock Wool Building Insulation . . . Heat Insulation . . . Waterproofing

specify Carey protection

SPECIFY CAREY PROTECTION

The roof of a school building represents little more than 1% of the total construction cost yet on its durability and weather-resisting qualities depend the protection of the other 99%. The school roof should be designed and built to last the life of the building. Re-roofing is an expense that need not be incurred under ordinary conditions if the right roof is selected and if it is properly constructed and maintained.

Carey Roofs meet every requirement for modern school construction. For more than forty years Carey Roofs have been specified for important public buildings throughout the United States, and their application to new school construction is increasing year by year because they have proved their durability and lasting protection against weather.

The quality of materials entering into Carey Built-Up Specifications are carefully checked by our engineering department and research laboratory. A liberal safety factor was allowed in tensile strength, number and thickness of plies, and waterproofing qualities. These specifications (covering 10, 15, 20-year Surety Bonded Roofs) can be obtained by writing to The Philip Carey Mfg. Co., Lockland, Cincinnati 15, Ohio. Refer to form number 4518.

FREE ROOF SURVEY

Any authorized Carey Inspector will, without obligating you, make a careful survey of your roofs, flashings, parapets, etc., and give you an honest and impartial report on their condition.

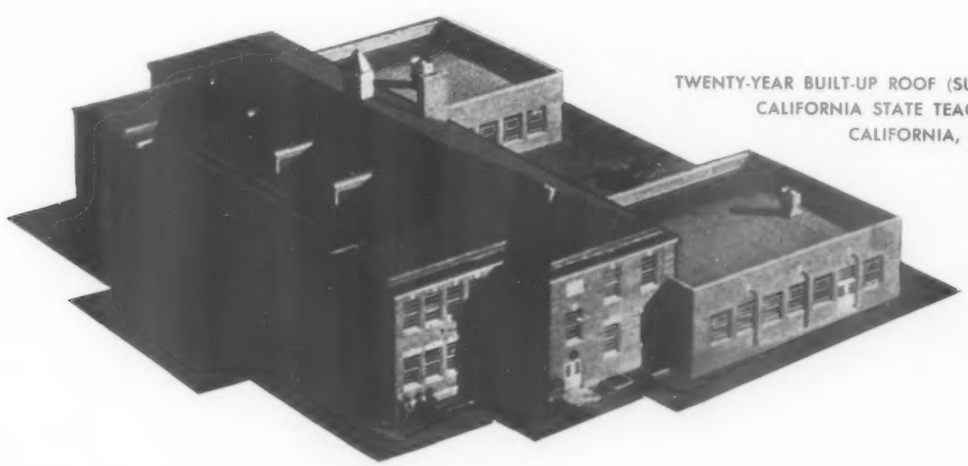
Carey Asphalt Shingles give dependable protection and attractive appearance. They are available in colors to provide harmony with any architectural style. All Carey Asphalt Shingles carry the Class "C" Underwriter's Label and are built to provide years of trouble-free service.

Careystone Asbestos Cement Shingles. Made of asbestos and cement, they provide a permanent roof possessing natural properties that enable it to resist the destructive influence of time, weather and fire.

Carey Heat Insulations. For low pressure steam or hot water heating systems, Careycel Pipe Covering has no equal. It combines high insulating efficiency with low cost. The Carey Heat Insulation Line is complete. There is a special insulation material to meet every service condition. Temperature ranges from zero to 2500° F.

Carey Rock Wool Building Insulation provides greater comfort and lower heating costs. Carey Rock Wool is suitable for installation in new or old buildings.

Carey Waterproofing materials are available to protect any vulnerable spot. Noah's Pitch is a permanently pliable putty that adheres to any building material. It is useful for repairing flashings, faulty shingles, leaks and cracks.



TWENTY-YEAR BUILT-UP ROOF (SURETY BONDED)
CALIFORNIA STATE TEACHERS COLLEGE
CALIFORNIA, PENNSYLVANIA

THE TEXAS COMPANY

Manufacturers of

TEXACO ASPHALT SHINGLES and ROOFING

FACTS ABOUT TEXACO ASPHALT ROOFING FOR SCHOOL AND UNIVERSITY USE

Lasting Economy

Texaco Asphalt Shingles and Roofing offer more advantages dollar for dollar than any other type of roofing.

Fire Underwriters' Approval

The Underwriters' Label is your assurance of protection against flying embers and sparks. This may permit reduction in insurance rates, subject to local fire conditions.

Protection Against the Weather

Asphalt is the oldest and most widely used weather- and water-proofing agent known to man.

Meets All Requirements

Texaco Asphalt Shingles and Roofing meet U. S. Army, Navy and other government specifications—meet or exceed structural specifications for educational buildings, both for new work and for re-roofing.

Attractive Appearance

Accepted patterns and pleasing colors make Texaco Asphalt Shingles and Roofing highly suitable for school and university use—blending with any architectural style.

Asphalt — Most Popular Type

Today asphalt is the most popular type of roofing in America. Economy, attractiveness and protection are the reasons for this preference over all other types of roofing.

Texaco Quality Well Known

Texaco Asphalt Shingles and Roofing maintain the standards of quality and dependability established by each of the more than 350 petroleum products of The Texas Company.

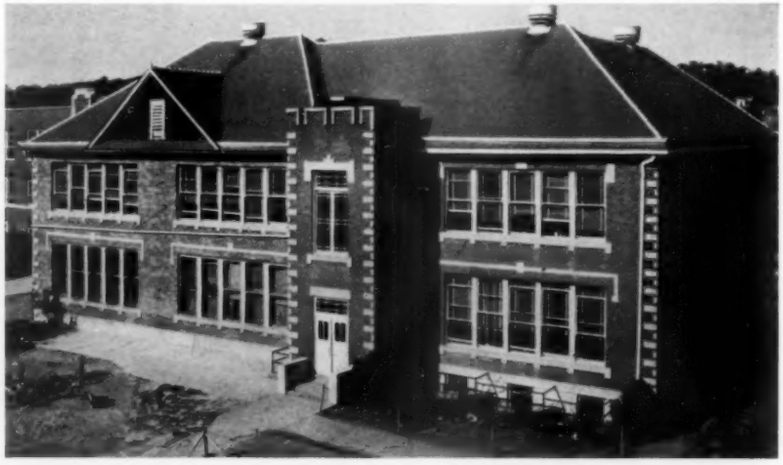
Convenient Source of Supply

The widespread distribution facilities of The Texas Company through the local Texaco Roofing Dealer assure prompt deliveries and helpful cooperation with all roofing problems.

• • •

FOR SAMPLES, COLORS AND SPECIFICATIONS SEE THE NEAREST TEXACO ROOFING DEALER OR WRITE TO THE NEAREST OFFICE OF THE TEXAS COMPANY OR TO THE TEXAS COMPANY, ROOFING SALES DIVISION, 135 E. 42ND ST., NEW YORK, 17, N. Y.

TEXACO — *a name that millions know*



TEXACO — *a name you can trust*

ONE OF MANY SCHOOL BUILDINGS ROOFED WITH TEXACO STRIP SHINGLES
Texaco Asphalt Shingles add beauty and color and years of economical protection

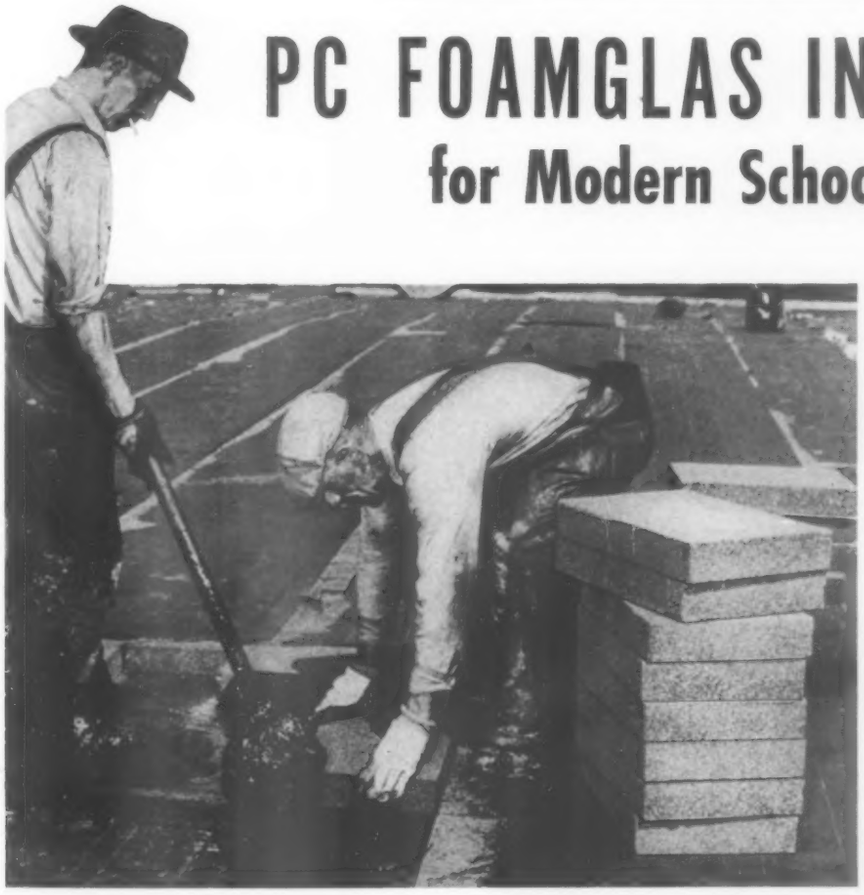
TEXACO ROOFING DEALERS EVERYWHERE East of the Rockies

The Texas Company *District Offices:* Atlanta, Ga. · Buffalo, N. Y. · Chicago, Ill. · Dallas, Texas · Denver, Colo. · Houston, Texas · Indianapolis, Ind. · Minneapolis, Minn. · New Orleans, La. · New York, N. Y. · Norfolk, Va.

PITTSBURGH CORNING CORPORATION

632 Duquesne Way • Pittsburgh 22, Pa.

PC FOAMGLAS INSULATION
for Modern School Roofs





This picture shows how PC Foamglas insulation is applied and how roofing is built up. Concrete slabs are covered with hot pitch or asphalt. Then, in turn, PC Foamglas, pitch or asphalt, four plies of roofing felt, pitch or asphalt and gravel are applied. All sorts of flat deck roofs, on all sorts of buildings all over the country, have been insulated—for good—with PC Foamglas.

ONE of the problems which face builders of new, modern schools is the selection of an efficient insulating material for the large area of flat roof. They are solving it effectively, economically, *permanently* by specifying PC Foamglas insulation.

Made of air-filled glass cells, PC Foamglas does not warp, shrink, swell, check or rot. It is impervious to moisture, vapor, and the fumes of most acids—elements that cause other materials to lose insulating efficiency.

PC Foamglas will help to maintain comfortable temperatures in top floor classrooms, winter and summer. Heat losses are reduced in the winter, thereby saving fuel, easing the load on the heating plant. Furthermore, the excess heat of the summer sun does not penetrate the roof to make rooms too warm for teachers and pupils.

We have published a booklet which contains charts and tables, detailed specifications and clear directions for installing PC Foamglas insulation. We shall be glad to send you a free copy. Pittsburgh Corning Corporation, Room 149, 632 Duquesne Way, Pittsburgh 22, Pa.



Providing a firm, level base for roofing felt, PC Foamglas, the permanent insulation, can be cut quickly to fit around openings and obstructions right on the job, with ordinary tools. When you are figuring a roof insulation job, figure on the most efficient, the most economical material—PC Foamglas.

FIRST COST IS LAST COST WITH PC FOAMGLAS
for these reasons . . .

Permanent Insulation
Moistureproof
Vaporproof

Fireproof
Verminproof
Light Weight

Economical
Strong, Rigid Structure
Quick, Easy Installation

Also Makers of PC Glass Blocks



PC FOAMGLAS *Waterproof Fireproof* **INSULATION**

T M REG U S PAT OFF

PITTSBURGH CORNING CORPORATION

632 Duquesne Way • Pittsburgh 22, Pa.



PC Glass Blocks

FOR SCHOOLS

offer ample light, utility and beauty

PC GLASS BLOCKS are unusually well suited for use in school construction. They provide greater operating efficiency for the building itself, greater comfort for students and instructors.

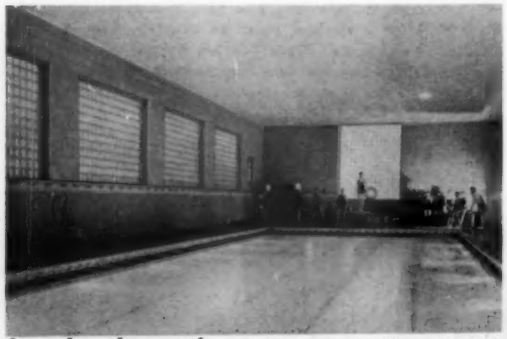
A generous supply of diffused daylight is supplied by large panels of glass blocks in auditoriums, gymnasiums, study halls and corridors. In classrooms where glass blocks are used, glare is reduced, yet ample light, directed even to remote desks, lessens eye-strain, enhances the well being and efficiency of pupils.

PC GLASS BLOCKS have the unique distinction of being the only building material capable of providing, in one unit, abundant diffused daylight, ease of cleaning, low maintenance cost and adequate insulation.

PC GLASS BLOCKS are suitable for any style of school construction. They blend harmoniously with the architectural design of old or new buildings, are ideally suited for sash replacement in older buildings as well as for new construction.

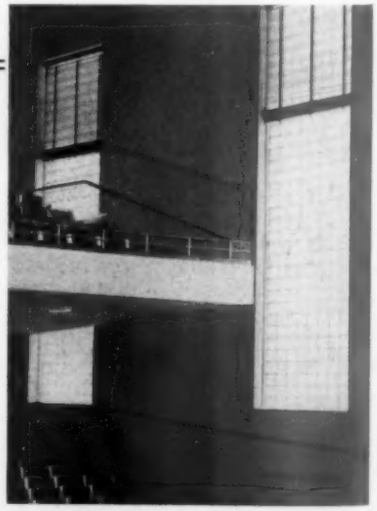


In classrooms, PC Glass Blocks supply ample diffused light even to remote desks, reduce glare and eye-strain, exclude distracting views and prevent infiltration of dirt and grit.



In swimming pools PC Glass Blocks direct natural light to areas remote from light openings. They withstand dampness, as there is no wood or metal sash to rot, check, scale, rust or need frequent repainting.

● For further information about PC Glass Blocks, write for our illustrated booklet, which shows many and varied uses of PC Glass Blocks in schools. It contains photographs of the full line of PC Glass Block patterns and describes the special functions of each. Also included are lists of available sizes and shapes, installation details and specifications. A free copy will be sent to you on request. Pittsburgh Corning Corporation, 632 Duquesne Way, Pittsburgh 22, Pa.



In auditoriums, study halls, corridors, PC Glass Blocks provide safe lighting, yet prevent heat losses through large panels. Repairs and replacements seldom are needed, cleaning and maintenance costs are low.

Also Makers of PC Foamglas Insulation

PITTSBURGH PC CORNING GLASS BLOCKS

Distributed by PITTSBURGH PLATE GLASS COMPANY and by W. P. Fuller & Co. on the Pacific Coast

MICHAEL FLYNN MANUFACTURING CO.

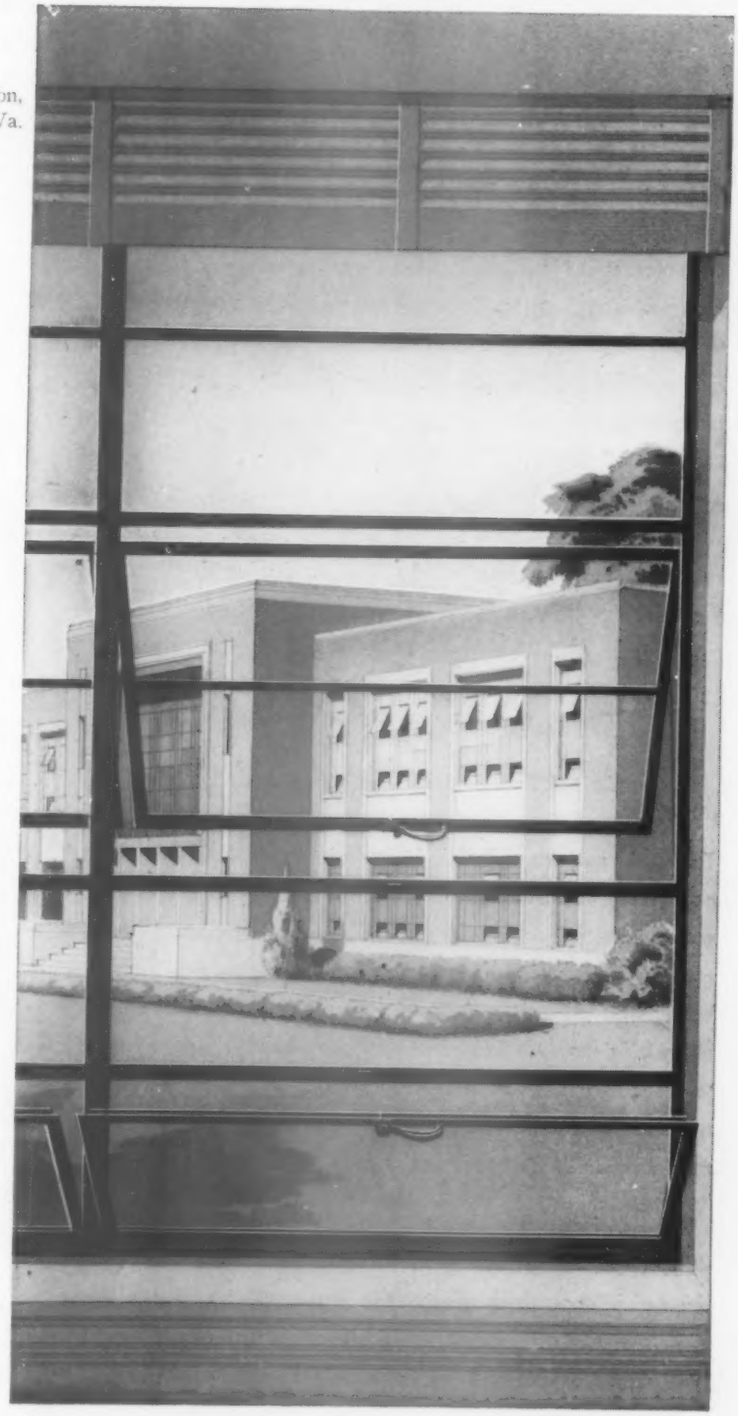
(MEMBER METAL WINDOW INSTITUTE)

E. Allegheny Ave. at Tulip St., Philadelphia 34, Pa.

Manufacturers of Metal Windows, Doors, Skylights, and Window Operating Devices

LUPTON METAL WINDOWS

Oakton Elementary School, Fairfax County, Virginia. Division of School Buildings, State Dept. of Education, *Architect.* E. E. Lyons, General Contractor, Vienna, Va.



Schools . . . For cheerful, pleasant classrooms, with abundant daylighting and easily controlled, natural draft-free ventilation, specify Lupton Metal Windows. Simple in design; rugged in construction; weathertight. The result of more than forty years' experience.

Lupton Windows are now available in the New Post War Sizes. Write for our Catalog giving complete information, or see our catalog in Sweet's Architectural file or Sweet's Engineering file.

MICHAEL FLYNN MANUFACTURING CO.

(Member Metal Window Institute)

THE COLUMBIA MILLS, INC.

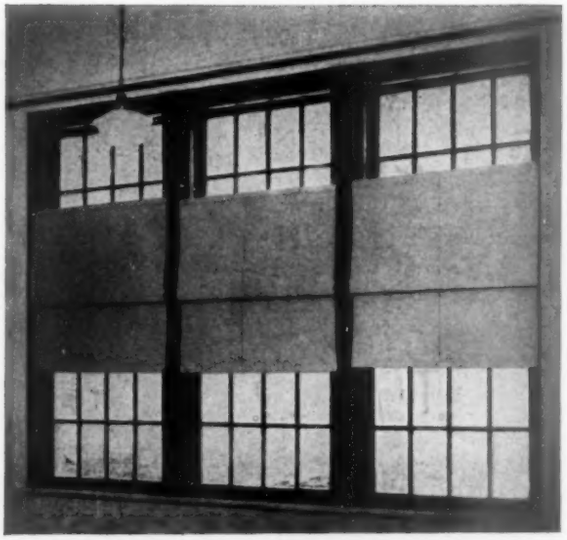
225 Fifth Avenue, New York 10, N. Y.

Columbia Window Shades and Venetian Blinds

Depend on *Columbia* WINDOW SHADES for Correct Diffusion of Light

Scientifically Made to Cast Abundant Glow of Sunlite while Eliminating Glare

Of paramount importance in the classroom are good, light-diffusing window shades. Correctly filtered sunlight is more restful to the eyes than direct rays . . . helps cut down eyestrain, fatigue and restlessness. Columbia has long specialized in shades that bring in soothing, ample light. Made to stand up to the hard usage of classrooms, Columbia shades are woven of rugged, easy-to-clean fabrics . . . and are made to operate quietly and with long-life efficiency. You will be grateful to the fine service and eye-easing properties of Columbia shades if you specify them for the classrooms in your school.



Approved for easiest adjustment. This style directs light where needed most, permits correct ventilation.

• • •

Smooth-Operating Columbia Venetian Blinds for School Offices

To add beauty, as well as light and air control, Columbia's wood or metal slat Venetian blinds are preferred for most school offices and teacher recreation rooms. Leading schools and universities all over the country are equipped with Columbia blinds in the rooms which need attractive window coverings as well as smooth-operating efficiency. All Columbia blinds are heavily enamel-coated to resist chipping . . . to stand innumerable cleanings. You will appreciate their fool-proof mechanism, made to give years of constantly satisfactory service.



A handsome style for offices, recreation rooms. Mechanism is concealed for greater beauty. Variety of colored tapes available.

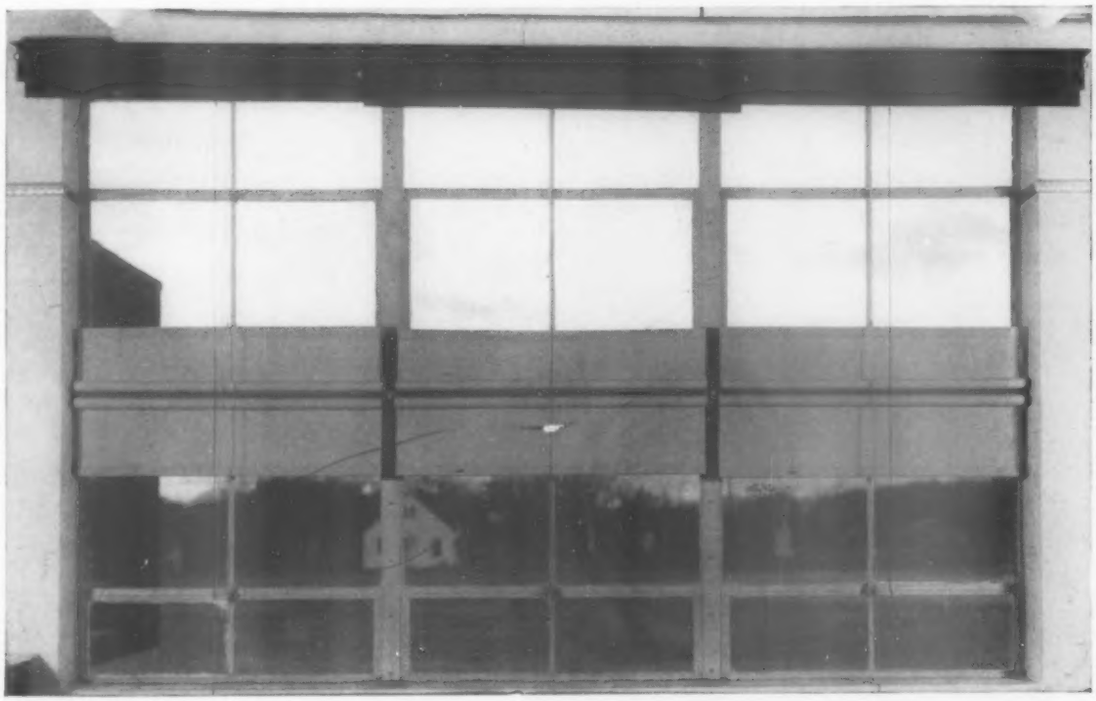
We have been making window coverings for over 50 years. Columbia window shades and Venetian Blinds are sold through dealers who are expert at measuring and installing shades and blinds which will fit perfectly and operate with the utmost satisfaction.

LUTHER O. DRAPER SHADE COMPANY

Dept. AS 46

Spiceland, Indiana

DUAL SHADING ON THIS PRINCIPLE IS SIMPLE AND SUCCESSFUL



N. B. — Draper X-L Unit of three black shades attached above the window head on the face of the wall.

WITH YOUR RULER — Cover one set of shades at a time and note the value of the two shade mountings.

The X-L Unit of black shades is mounted on the wall and in this position overlaps wall openings of unusual and unlimited width.

The Draper Demountable V-Double Roller Shades are installed on the steel sash inside the wall opening.

The window in above photograph with bay of steel sash has translucent Double Roller Shades Demountably applied: (1) by rigid V shape roller supporting light shield, easily removable by lifting pin at each end of V shield; (2) by the Draper Pulley Bracket which freely and solidly supports the pulley of the upper shade. Draper furnishes the fixtures complete for mounting the shade properly. Sash manufacturer delivers the sash with the holes punched in the proper location **(no drilling on the job)** if specified.

With clear wall space at the top and the sides of the window (no moldings, pipes or partitions to interfere) the Draper X-L unit of Black Shades is easily mounted to the wall or, if wall space above window were not available, the inverted L shape bracket shield attaches to the ceiling. These Visual Education Darkening Shades have no connection to the window sash and exclude the light on the simplest principle of cloth overlap one shade on another and over the wall beyond the window jambs. There is no limit to shade width on this principle. No fixtures except the novel roller brackets which are in combination with the inverted L shape shield across the window head.

On wood frame windows the application of the two complete sets of shades can be the same in principle as shown for steel sash.

Gymnasium-Auditoriums are used for visual education. Keep wall space around the window openings clear for overlapping shades. Avoid any mechanical sash operators, window guards or fixtures that project into the room. A clear flat wall space of at least 8 inches beyond the sides of the window opening and to the front of the wall line at the window head should be provided. This cooperation by the Architect and the sash manufacturer is valuable consideration to the use of the building. Write for full information.

Provide All Windows for Use of Darkening Shades

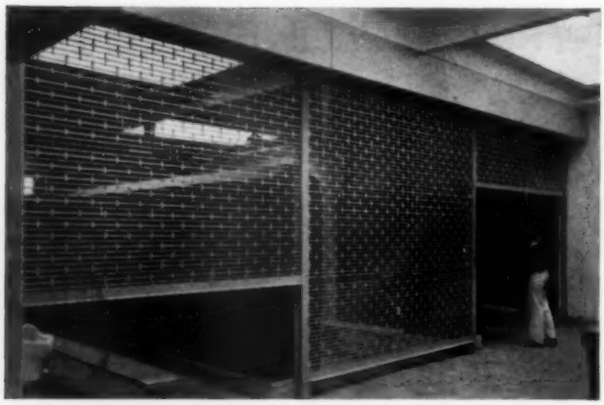
CORNELL IRON WORKS, INC.

ESTABLISHED
Since 1828

36th Avenue at 12th Street, Long Island City, N. Y.

Telephone
STillwell 4-3880-1-2-3

102 REPRESENTATIVES IN PRINCIPAL CITIES



Three CORNELL ROLLING GRILLES separating locker rooms from gymnasium; Castlemont High School, Oakland, California

PRODUCTS

ROLLING GRILLES and GATES in steel and other metals; SLIDING GRILLES in steel or aluminum; ROLLING DOORS and SHUTTERS in steel, other metals and wood; Underwriters labeled rolling STEEL FIRE DOORS; complete line of UPWARD ACTING DOORS in wood or metal; MOTOR OPERATORS.

Makers of fine doors for over one hundred years. CORNELL IRON WORKS, INC., owes its origin to George Cornell, who purchased his employer's metal business July 29th, 1828, in New York City.

SEND FOR CATALOG V



(Above) ROLLING STEEL DOOR. Coils overhead out of the way. Rugged, fireproof and burglar proof. Counterbalanced and easily operated, up to 45 ft. wide and 100 ft. high. Hand or motor driven

CORNELL ROLLING DOORS AND ROLLING GRILLES



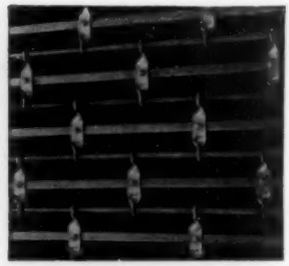
CORNELL ROLLING GRILLE in school corridor, Kansas. Side guides and overhead coil are concealed in jambs and ceiling

The doors proper are made up of interlocking metal slats running in vertical metal side guides, flexible to coil. Steel curtains are hot galvanized. Wood slats strung on metal cables form the curtain of wood rolling doors.

Rolling Fire Doors are labeled by Underwriters' Laboratories, Inc., for fire walls, etc.

Cornell Iron Works, Inc., are the originators of the Rolling Grille in America. Cornell Rolling Grilles operate like rolling doors, but they do not block light, air, or vision. They have been widely accepted for school corridors, etc. Can be completely concealed when open. Rolling Grilles are made of 5/16" round hard drawn galvanized steel bars running continuous horizontally from jamb to jamb and locked into rolled steel vertical side guides. The horizontal bars are flexibly connected by unbreakable vertical steel links; permitting entire grille to coil overhead.

Patented Locking Device for Rolling Grilles is workable from either side.



Close-up view of ROLLING GRILLE curtain, CORNELL Standard Butterfly Type



(Above, Right) LABELED ROLLING STEEL (Lienroc) FIRE DOOR, coiling under lintel in the opening between the jambs. Shown in section. Note the overhead counterbalancing shaft, used both in rolling doors and rolling grilles; and the enclosing hood. Side guides may be concealed in the wall and the overhead coil hidden in the ceiling

CORNELL *SLIDING* GRILLES

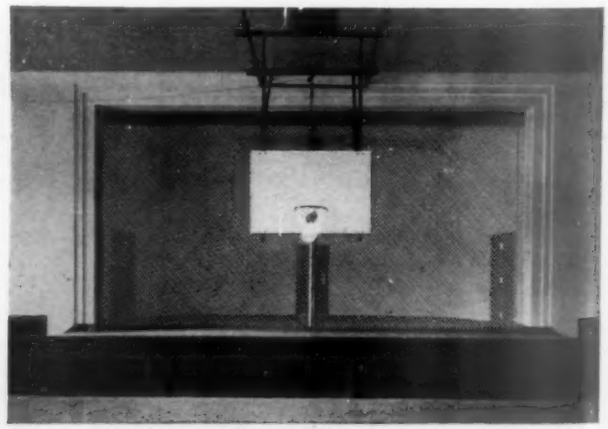
A Cornell Sliding Grille gives high protection at exceptionally low cost. It is a patented steel curtain of heaviest galvanized chain link factory fence, extended to any height of opening by galvanized rods running to track above. The grilles can be used anywhere to keep out intruders and allow free circulation of air. The construction makes it possible to nest the sliding Grilles at the side of an opening in a space only 1/6 of the opening width. Grille will travel around a curve, and lie at a right angle to opening if there is 10" room available from edge of jamb.

Cornell Sliding Grilles are recommended for school corridors, as a low priced substitute for Rolling Grilles; for auditoriums and stages; for gymnasium and court windows, entrances, gates or partitions; and for athletic and parking areas.



(Right) Close-up of CORNELL *SLIDING* GRILLE

Note cap at each top joint. Vertical galvanized rods connect to overhead track



Showing use for large SLIDING GRILLE in combination auditorium and gym in New Jersey School

THE KINNEAR MANUFACTURING CO.

PLANTS: COLUMBUS 16, OHIO, 1760-80 Fields Ave. — SAN FRANCISCO 24, CALIF., 1742 Yosemite Ave.

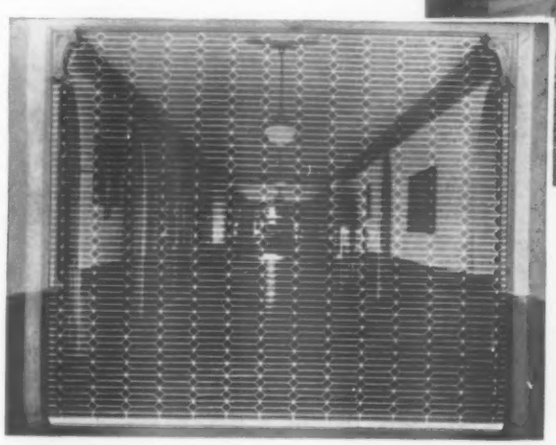
Manufacturers Exclusively of Rolling Doors and Grilles

PRODUCTS—Wood or Steel Rolling Service Doors, Automatic Fire Doors and Shutters, Metal Rolling Grilles, Wood Rolling Partitions and Wood or Steel Upward-Acting Doors.

GENERAL—The Kinnear Manufacturing Company pioneered and have devoted their entire effort for the past half century to Rolling or Upward-Acting type Doors and Grilles. They have established the reputation throughout the world as specialists in doors that save floor and wall space, operate more conveniently, reduce maintenance expense through unusual durability and that can be built for old or new buildings for inside or outside use.



Kinnear Motor Operated Rolling Service Door — Wood or Steel



Metal Rolling Grille for Inside or Outside Use

Permanently installed but may be rolled up out of sight. When closed, admits air, light and vision. Also, if desired, may be locked to prevent raising.



Automatic Fire Shutters for Doors or Windows

ROLLING DOORS—Kinnear Rolling Doors are composed of either a flexible wood or metal curtain which coils above the lintel, similar to a window shade. They can be installed either on the face of the wall or between the jambs when concealment of the mechanism is desired. Springs provide perfect counterbalance. They can also be operated manually, mechanically or electrically. Built of the finest materials and to high manufacturing standards they give years of dependable service.

METAL ROLLING GRILLES—Operating on the same principle as the Rolling Door, the Kinnear Rolling Grille is a permanently installed and attractively designed barrier that is remarkably strong when closed and locked, but out of sight when opened. When down, it admits air and light, and does not obstruct vision, making it particularly applicable to all types of interior and exterior openings as well as hallways in school buildings. The grille proper is of remarkable strength and artistically designed of steel bars spaced close enough to prevent the admittance of large projectiles or a man's hand. For locking in closed position a lock is furnished. The Kinnear Rolling Grille may be mounted on the face of the wall with brackets and coils entirely above the bottom of the lintel and with edges of guides flush with the face of opening jambs; or where headroom is limited and grille cannot be installed on the face of the wall it may be mounted in the opening.

AUTOMATIC FIRE DOORS AND SHUTTERS—Kinnear Fire Doors, though suitable for service purposes, are "labeled" and equipped with mechanism for automatic closure in case of fire. They are suited for installation in outside or inside door or window openings and in general construction, operation and mounting are similar to Steel Rolling Service Doors. To insure maximum fire protection they are equipped with an auxiliary push-down spring to insure positive closure; a governor for controlling speed of curtain closure; auxiliary hood to protect counterbalance mechanism; and other features in excess of the requirements of the Underwriters' Laboratories. Their superior design has proved its worth in many major conflagrations.

BRANCH OFFICES

Boston, New York, Philadelphia, Washington, New Orleans, Pittsburgh, Cleveland, Cincinnati, Detroit, Chicago, San Francisco, Baltimore

AGENTS IN ALL PRINCIPAL CITIES

KINNEAR ROLLING DOORS

THE SANYMETAL PRODUCTS CO., INC.

1702 Urbana Road, Cleveland 12, Ohio

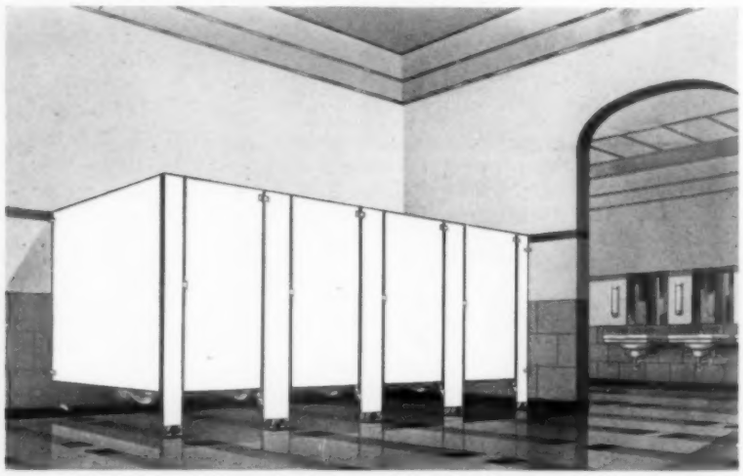
*Sanymetal** TOILET COMPARTMENTS

● The Sanymetal Products Co., Inc., offers five different types of toilet compartments suitable for installation in new or existing educational buildings. They are designed and built by Sanymetal specialists with over 32 years' experience in making over 70,000 installations, and embody convenience and sanitation in a degree usually overlooked by those lacking Sanymetal's long experience in this line.

Sanymetal Toilet Compartments combine simplicity of design with sound mechanical construction in order to provide a rigid and durable installation, free from dirt-collecting pockets and ledges, and easy to keep clean. Their design and materials impart refinement and cheerfulness, and elevate the toilet room into keeping with other appointments of the building.

Nowhere in a school building are unwholesome tendencies more easily evident than in an unclean, outmoded toilet room, which may unconsciously influence youth to assume a careless attitude toward such matters and encourage obscenity. For this reason Sanymetal Toilet Compartments stress modernity and beauty, combined with utmost cleanliness, good taste and orderliness . . . creating a wholesome environment.

Three of the five Sanymetal Toilet Compartments described here are particularly suitable for educational buildings because they are built to stand up against the abusive treatment often accorded to such equipment.



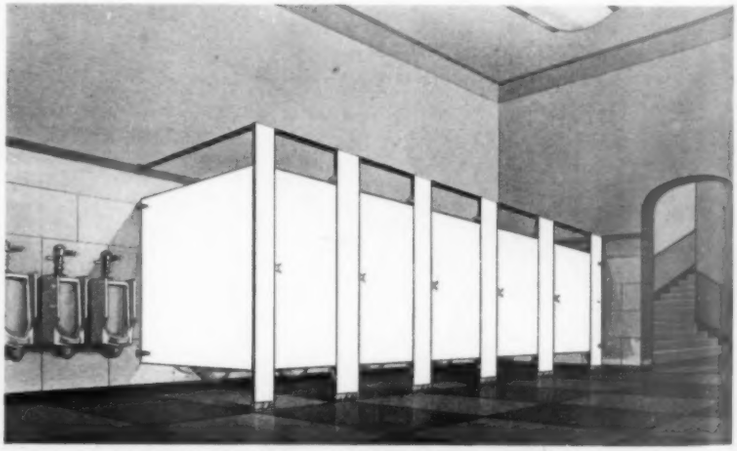
NORMANDIE TYPE TOILET COMPARTMENTS

● A streamline effect is moderately imparted to a toilet room environment when Normandie Type Toilet Compartments are installed. Pilaster tops on the same horizontal plane as the tops of Partitions and Doors give the true streamline effect.
Through skillful Pilaster design and construction and manner of fastening Pilasters to the floor, a degree of rigidity is obtained that is fixed and permanent.

Normandie Type Toilet Compartments consist of just three units: Pilasters (flush front), Partitions and Doors (flush type, fully insulated) : a simple, mechanically correct construction. Complete specifications in Catalog 84.

ACADEMY TYPE TOILET COMPARTMENTS

● There's a certain refinement and distinctiveness about an installation of Academy Type Toilet Compartments that produces a wholesome atmosphere in school toilet rooms. With Flush Pilasters extending well above the doors and partitions, and united with an overhead brace of modern design, this type of compartment is the only one in which all of the dignity and distinctiveness of flush type construction, unmarred by posts, is appropriately combined with the headrail. Pilasters replacing posts and extending well above the Doors and Partitions, are flush type insulated panels. They present a flat, smooth surface on both sides that is easy to clean. Academy Type Toilet Compartments consist of just four units: Pilasters (flush front); Partitions and Door (flush type, fully insulated); and headrail assembly:—a strong, sound construction throughout. Complete specifications in Catalog 84.



FINISHES AND COLORS

The three types of Toilet Compartments illustrated are available in three finishes: (1) "Porcena" (porcelain on steel); (2) "Tenac" (baked-on paint enamel finish over galvanized, bonderized steel); (3) Baked-on paint enamel finish over regular furniture finish cold rolled steel. Toilet compartments are available in many colors. For further information consult with a Sanymetal representative or write direct to the factory

SANYMETAL "PORCENA" (*Porcelain on Steel*) TOILET COMPARTMENTS

To be sure of strictly modern toilet room environments use this ageless material

● SANYMETAL "PORCENA" (porcelain on steel) presents a correct combination of the desirable qualities of the hardness of glass and the strength of steel. This ageless and fadeless material provides the utmost in sanitation, protection against obsolescence and a certain elegance and beauty that is otherwise unobtainable.

● SANYMETAL "PORCENA" (porcelain on steel) Toilet Compartments are particularly appropriate for installation in educational buildings as their sturdiness and ageless finish withstands shocks and hard usage without injury to the smooth lustrous surface. Sanymetal "Porcena" (porcelain on steel) is impervious to odors, moisture, ordinary acids, oils and grease, and is rustproof. It is as easy to keep clean as wiping the kitchen range, as the finish is non-porous and flint-hard. It discourages the common inclination to disfigure toilet room equipment.

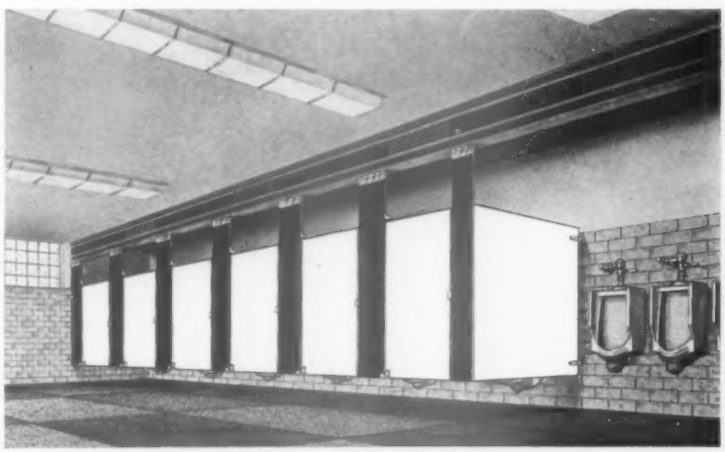
● SANYMETAL "PORCENA" (porcelain on steel) Partitions and Doors are Flush Type, insulated, and approximately 1-inch thick. Each partition panel and door is formed by assembling two sheets of porcelain finished steel to a rigid, dense, sound-deadening ⅞-inch insulating core. Thus, a partition panel or door is formed *that greatly exceeds the usual resistance to damaging blows*, of other materials commonly used for toilet compartments.

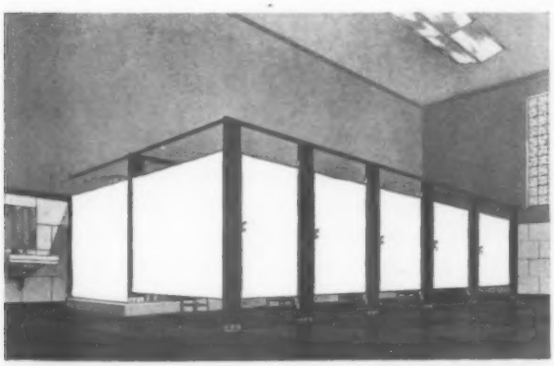
● SANYMETAL "PORCENA" (porcelain on steel) is indeed the ageless material that always stays new, and cannot be surpassed by any other existing material from the standpoint of sanitation and maintenance. Complete description of Sanymetal "Porcena" in Catalog 84.

CENTURY TYPE CEILING HUNG TOILET COMPARTMENTS

● Sanymetal Century Type Ceiling Hung Toilet Compartments provide an element of modernity and utility, combined with utmost cleanliness, that gives long time assurance against obsolescence. Strikingly new in design, finish and construction. Note in the illustration that the floor is free of obstructions. This permits quick and efficient cleaning.

Basically, a Century Type Toilet Compartment consists of just three units: Pilasters (flush front) suspended from a ceiling beam; Partitions and Doors (flush type, fully insulated). Complete specifications in Catalog 84.





SANYMETAL "PORCENA" SHOWER STALLS AND DRESSING ROOM COMPARTMENTS

● Shower stall installations, with or without dressing rooms, when built of Sanymetal "Porcena" (porcelain on steel) Partitions, Doors and Pilasters, encourage those who use these facilities to cooperate in keeping them orderly and neat. Their hard, flint-like surface does not absorb heavy odors. The residue of shower bathing that would ordinarily adhere to the surface of partitions and doors does not adhere to the smooth, glistening porcelain enamel surfaces. With as little effort as it takes to keep the porcelain surfaces of household appliances sweet and clean, these Partitions and Doors can be kept strictly sanitary.

OTHER SANYMETAL PRODUCTS FOR SCHOOL AND EDUCATIONAL INSTITUTIONS

● Sanymetal provides a wide range of accessory equipment for furnishing toilet and washrooms in school and educational buildings. These products include: Shower Cabinets, Several Types; Dressing Room Compartments; Utility Enclosures; Entrance Screens; Janitors' Closets; and "Porcena" Wainscot for wall treatments. Complete specifications in Catalog 84.

NAILOCK STEEL NAILING CHANNELS

● Nailock Nailing Channels provide a new method for attaching accoustical materials, tile, panels, slabs, sheets and other kinds of covering, flat or corrugated, in fact any nailable material, over steel or concrete. The method is as simple and safe as it is permanent and economical.

For further information contact the Engineering Department, Nailock Steel Division, The Sanymetal Products Co., Inc.

THE SANYMETAL PRODUCTS CO., INC.

1702 Urbana Road CLEVELAND, OHIO

FREDERIC BLANK & COMPANY, INC.

ESTABLISHED 1913

New York Central Building, 230 Park Avenue, New York 17, N. Y.

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fabron REG. U. S. PAT. OFF — THE FABRIC WALL COVERING FOR SCHOOLS

Color and Texture for Modern School Interiors

Today, making buildings attractive—whatever their function—is a major objective. School managements have recognized the importance of establishing a proper environment as an aid in developing the best approach to life—and have found the introduction of color in interiors a most important step in this direction.

Progressive methods demand the intelligent use of color in accord with the rising standards of informed public taste. Color in schools is correctly used only when it has proper relationship to the entire interior—its size, exposure, correct light reflection, glare reduction, function, etc. In this respect it differs from color in the home where personal tastes usually guide the selection. In schools, however, functional considerations not only determine color but also the **"medium"** of its application, which medium will insure **collective benefits** to the pupils as well as the superintendent in charge of maintenance.

FABRON, the fabric and plastic wall covering manufactured in solid colors and functional textures, represents the **medium** specifically devised to solve these decorative problems. Textures, which present a plain appearance, are produced for walls which receive hard wear—they conceal plaster imperfections, do not show soils readily, require a minimum of upkeep, lend themselves to invisible patching—an ideal combination of features for a wall finish for school interiors, from the angle of the superintendent and pupils alike.

Specialized Advisory Service

Our School Advisory Department with more than 30 years of technical and practical experience in solving school and institutional decorative problems is at your disposal. We co-operate with your architect and your staff in preparing from your blueprints a co-ordinated and complete decorative schedule of color and texture, with samples, quantities, costs, etc., which is submitted with the reasons that motivate the recommendations. Our service is cost free.

What Fabron Is

FABRON is a specially treated fabric devised for the correct architectural finishing of interior walls and ceilings. It incorporates structural, decorative and economical advantages resulting from years of laboratory research plus practical experience in wall covering installations in all types of buildings.

Exclusive Characteristics

FABRON has a sturdy canvas foundation on which layers of plastic coatings have been applied and finished with specially compounded lacquer paints, all fused into a structural unit to withstand hard usage. In one operation, FABRON seals and finishes the plaster surface and gives it decorative value.

Patterns and Color Range

FABRON is produced in a range of solid colors, functional textures and decorative patterns for every type of school interior—Auditoriums, Classrooms, Corridors, Dormitories, Lobbies, Libraries, Offices, and Public Rooms. All are sunfast—washable.

Efficient Roll Size—Easy to Apply

FABRON comes in convenient double rolls measuring 27" wide by 33¼' long—a finished surface ready to use. It is hung in the same manner and as easily as any good wallpaper. Any paperhanger of average skill can do the job. It can be installed in a fraction of the time required for painting, without the inconvenience of offensive odors. A room can be occupied the same day it is decorated.

Established Color Scheme Guaranteed

FABRON eliminates all uncertainties connected with hand-applied paint. No mixing or matching of colors, no misunderstandings, no disappointments. Once the color and texture are chosen and FABRON is specified, the job is as good as done and done the way it is specified because the surface is standard in quality, mechanically uniform, and perfect.

Economical in Cost

The cost of FABRON ranges from 3 1/3 cents per square foot up. Elaborate designs cost in proportion. Quality is uniform regardless of price. Its initial cost lies within the average budget for good work and it need not be much higher than good paint which offers no plaster protection. Because it gives years of service and eliminates recurring redecoration costs, its final cost is the most economical of any wall and ceiling treatment.

IN ONE OPERATION FABRON COMPLETES THE SURFACE

Figured on a cost-per-year basis or when considered in relation to capital investment, duration of service, maintenance and repairs FABRON is the most economical wall and ceiling treatment for schools. Its use eliminates the constantly recurring redecoration expense that eats into budgets.

fabron REG. U. S. PAT. OFF AFFORDS BOTH STRUCTURAL AND PRACTICAL ADVANTAGES

Plaster Protection

FABRON'S sturdy canvas and plastic body gives **permanent** protection to plaster surfaces. . . . It prevents the appearance of unsightly cracks, unavoidable at times in both new and old buildings, which mar wall decorations. . . . In old structures, it binds and strengthens weakened or patched plaster, covers wall blemishes and conceals irregularities.

Readily Removable for Repairs

FABRON eliminates expensive restorations. In case of plaster damages, strips can be lifted, coming "clean" from the wall, the repairs made and the strips reapplied. Damages to FABRON can be patched easily and invisibly by the inset method; any paperhanger of average skill can do this work.

Economy of Upkeep Thoroughly Washable

The washability of FABRON is not superficial but inherent in the product itself. It can be washed simply and easily with water, a soft cloth or sponge and neutral soap, as often as necessary, even by inexperienced help, without affecting its colors.

Sanitary Protection

FABRON can be disinfected with antiseptic solutions commonly used in hospitals for such purposes, without affecting its surface or colors. Waterproof and non-porous, it does not retain soot or dust which are easily washed away. It is vermin proof and odor proof.

Colors are Sunfast

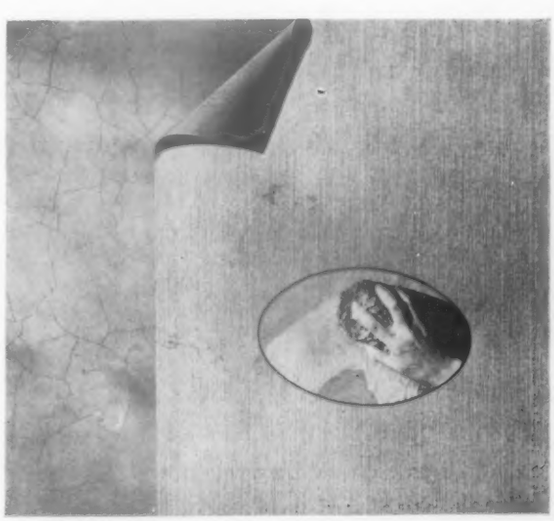
The lacquer paints of FABRON are compounded to resist the action of light. They retain their original beauty and prevent interiors from going stale—this is insurance against depreciation.

Permanent Base for Subsequent Paint or Other Treatments

FABRON'S impervious surface is non-scaling, non-peeling, and resistant to scuffing and scratching. After many years, and when it has outlived its original decorative function, it offers an ideal base for subsequent paint, protecting the walls from cracks indefinitely, thus unlike paint, FABRON **continues** to serve and its initial investment is not irretrievably lost.

STUDY THESE SAMPLES OF FABRON
Experiment with them
FABRON IS NOT AN OILCLOTH





FABRON is easily applied. . . . It prevents the appearance of cracks, strengthens weakened plaster, covers wall blemishes. . . . It is decorative. . . . It is sunfast. . . . It washes clean readily. . . . It is durable and economical

. . . AND IMPARTS DECORATIVE VALUE TO INTERIORS

LOXIT SYSTEMS, INC.

1217 West Washington Boulevard, Chicago 7, Illinois

THE LOXIT SYSTEMS

GENERAL INFORMATION

The LOXIT SYSTEMS lay, set, and suspend by mechanical means, building materials and accessories such as flooring, acoustical tiles and slabs, blackboards, trims, etc., usually nailed or screwed on or applied with adhesives.

In principle the LOXIT SYSTEMS are designed so as to either control or compensate for expansion, contraction, and settlement in buildings. The mechanical parts of the LOXIT SYSTEMS interlock—giving LOXIT its name.

No special tools are required. Any good mechanic can learn to use any of the LOXIT SYSTEMS in a few hours' time.

The LOXIT SYSTEMS, being mechanical, assure uniformity, flexibility, and permanence in a job that is not readily attainable with common and less certain methods, using nails or adhesives for fastening or holding together the materials.

UNIFORMITY:—Uniformity is a quality that is inherent in mechanical systems as it means the putting together of the various parts involved in the system thru means, devices, and procedures that are designed and manufactured to be always used in the same way, assuring a sameness in the results that cannot be obtained by unmechanical means.

FLEXIBILITY:—Flexibility is another of those qualities that is inherent in mechanical systems because it permits the taking down or apart and the putting together again of the various elements that compose that system. Adjustments can be made for settling, shrinkage, and even for expansion and replacements or repairs that would not be possible otherwise. This flexibility is not available to materials put together with nails or adhesives as the materials themselves are destroyed or more or less damaged when they are taken apart, with the result that they cannot be reused or only a small portion can be.

PERMANENCE:—While permanence has been achieved and is possible with the ordinary ways of putting materials together, greater permanence with the added advantage of uniformity and flexibility almost always is an assurance when using mechanical methods in the execution of the job, because a usually tighter job and a usually better executed job can be obtained by mechanical means.

MAINTENANCE:—It should be apparent that the cost and efficiency of maintenance is directly related to the quality of the job to which it is applied. Therefore maintenance is greatly reduced both in labor and cost when the completed job is uniform, flexible, and permanent. These qualities are inherent in mechanical systems and therefore assure better maintenance conditions.

THE LOXIT SYSTEMS

I. LOXIT Strip Floor Laying System.
II. LOXIT Acoustical Tile and Slab Laying Systems:
- Type 1. A—Using straight edged materials laid with matched joints, fireproof construction.
- B—Using straight edged materials laid with staggered joints, fireproof construction.
- C—Using straight edged materials laid with matched joints secured to wood furring.
- D—Using straight edged materials laid with staggered joints secured to wood furring.
- Type 2. Using kerfed materials.
- Type 3. For resetting materials that have been nailed or glued to ceilings and walls, and have become loose.

All of these systems can be used for both suspended and directly applied materials. Types 1 and 2 can also be used with Loxit suspension clips—giving any depth of suspension wanted without pencil rods, furring or other suspension members.

III. LOXIT Spring Type Blackboard Setting System.
IV. LOXIT New Improved Inclined Chalk Trough.
V. LOXIT Interlocking Metal Shims.
VI. LOXIT Storage Racks—for materials in long lengths.
VII. LOXIT Metal Trim, Moulding, Thresholds and Stair Nosings.

THE LOXIT FLOOR LAYING SYSTEM



View of floor of Patten Gymnasium, Northwestern University, Evanston, Ill., while being laid. Holabird & Root, Architects. R. C. Wieboldt, Contractor

A PROVEN, ECONOMICAL SYSTEM FOR ALL TYPES OF BUILDINGS—The Loxit system is a simple mechanical method for laying ordinary T&G strip wood flooring without nails, wood sleepers, or adhesives. It consists of:

(a) A metal channel 1⅛ in. wide by 5/16 in. high with overlapping top edges, punched 4 in. o. c. for fastening.

(b) Uniquely designed clips to be used in laying and locking the floor boards together and to the channels.

ADVANTAGES OF THE LOXIT SYSTEM—

1. Total overall thickness of a Loxit laid floor including 13/16 in. flooring is 1⅛ in.

2. Floor can be laid without expansion joints as the Loxit system limits expansion.

3. Loxit floors can be laid tight, in fact the tighter the better, provided the usual precautions as to building conditions and acclimatization of the flooring have been taken, thereby securing a tight floor to start with.

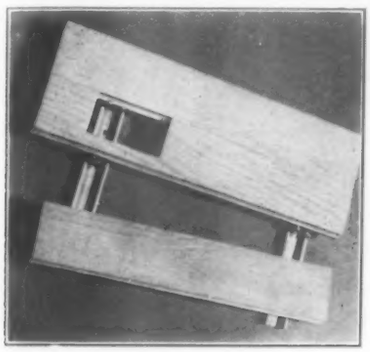
4. Excessive shrinkage, repairs, and replacements can be easily and economically handled when floors are laid with the Loxit system because they can be taken up and re-laid without waste other than new clips.

5. Squeaks in wood floors are caused by vertical movement. When Loxit channels are properly shimmed and grouted and the flooring securely locked into place in accordance with instructions, vertical movement is eliminated and squeaking avoided.

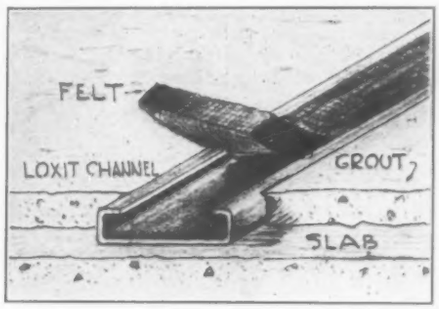
6. Floor may be satisfactorily laid in basements and other areas where other types of wood flooring could not be used by following the simple precautions that are necessary under such conditions.

7. Loxit laid floors require only light sanding.

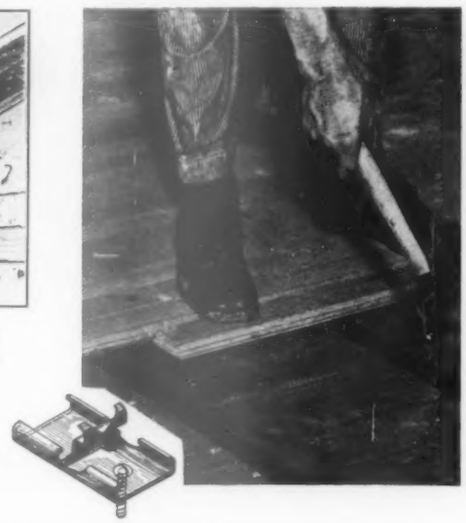
8 No special milling is required. All flooring milled in accordance with the gauge adopted by the hardwood flooring manufacturers' associations can be used.



Close-up detail showing LOXIT channels . . . clips in place



Detail showing LOXIT channels grouted. Felt is used to keep channels clean



Detail showing close-up of clip and method used to lay flooring

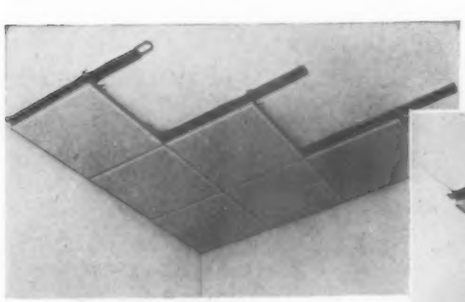
LOXIT ACOUSTICAL SUSPENSION SYSTEMS

If you have an acoustical tile suspension problem you will find the solution in one or a combination of the Loxit suspension methods available for use with straight edged or kerfed tiles and slabs, applied directly to ceilings, walls, beams, ducts, etc., or suspended. There are three types of Loxit acoustical systems:

Type 1—Straight edged tile system.
Type 2—Kerfed tile system.
Type 3—Surface applied system.

VERSATILITY OF THE LOXIT SYSTEM—In no other system can the architect or acoustical contractor find the solution to all of their acoustical problems when using tiles and slabs kerfed or straight edged with matched or staggered joints applied directly to wall surfaces and ceilings or suspended.

We do not know of an acoustical tile and slab condition that cannot be solved with the Loxit system.



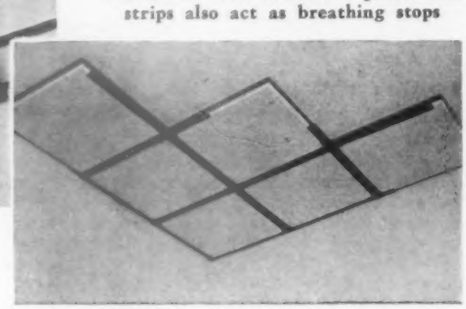
TYPE 1

This system is designed to be used with straight-edge tile, using LOXIT channel and clips that bite into the edge of the tile



TYPE 2

Type 2 **(at left) is the LOXIT kerfed tile system, using LOXIT channel and a series of hemmed splines and strips that fit into the kerfs of the tiles, interlock at the corners, and by means of special LOXIT clips suspend the tiles from the channel. Splines and strips also act as breathing stops**

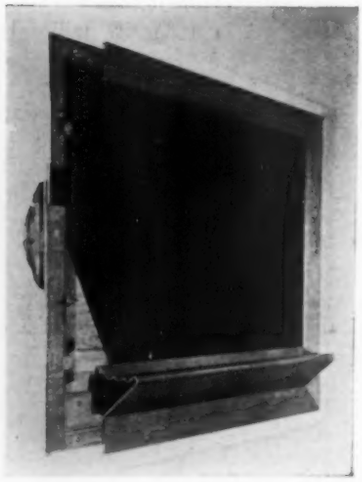


TYPE 3

Type 3—**Type 3 is a unique system composed of Loxit V strips, crosses, tees, and ells, specially designed to re-set acoustical tiles and slabs in existing installations that have become loose or for the setting of tiles and slabs directly to ceilings and walls by the use of a surface setting method which forms a wall or ceiling pattern at the same time acts as a positive breathing stop. Particularly adaptable to plastered ceilings. This system is available in primed steel sections ready for painting and in stainless steel.**

In using this system acoustical tiles and slabs not originally mechanically suspended become permanently fixed in place providing against any further movement or breathing.

LOXIT ALL-METAL BLACKBOARD AND CORKBOARD MOUNTING SYSTEM



Loxit blackboard mounting system in place showing construction



Detail showing new LOXIT inclined chalk trough

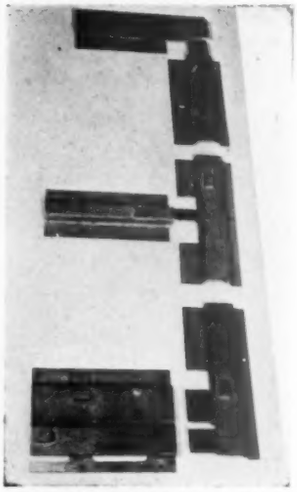
The Loxit system is more than just a ground or trim. It is a complete system combining a plaster ground with snap-on trim, including keys, springs, inserts, and clips to receive and hold the boards and trim, as self-contained units.

The system is designed to provide the maximum amount of adjustment, to assure rapid, economical and perfect installation and to maintain the permanent positions of the various parts after erection through automatic cushioning of the boards against reasonable contraction, expansion, settlement, etc.

ERECTION

It is so simple in principle and construction that any good workman can install it with ease and perfection. All grounds are drilled, slotted, and mitred at the factory to board dimensions shown in drawings, ready to set in place. Special alignment braces are provided for all corners, tees, and joints, making the setting of grounds easy and the placing of trim neat and true.

The Loxit system can be used with any type and thickness of board from ⅛" to ⅜", the adjustment for variations in thickness being automatic.



Detail showing ground

ACCESSORIES

Loxit fittings such as map hooks, paper clips, roller brackets, cork inserts, and their combinations are available for every purpose. They are designed to give a maximum freedom of movement and adjustment. They can be placed in and taken out from any point in the Loxit display rail; will slide freely into any position and cannot fall out, as a lower and upper groove automatically hold them to the rail.



In normal times the Loxit Company carries in stock the most composite stock of metal trim mouldings and thresholds in the world—more than 1200 different designs—in aluminum, brass, stainless steel, metal-covered wood, primed and unprimed steel, etc.

LOXIT metal mouldings and metal trims are available for all of the building trades including interior decorating; display fixtures; cabinet, table and counter facings and trims; floor and wall covering trims; picture frames, bulletin boards, etc.

SPECIAL MOULDINGS

While we are prepared to execute specially designed trim sections on order at the same comparative costs as our standard sections, we recommend, of course, that our standard sections be used if at all possible, as they were adopted only after the most careful studies of all of the problems involved for the purposes for which they were designed.

We maintain, however, an industrial design service that is available for the study of trim requirements not covered by our standard sections. We therefore invite your inquiries in this field. **When in need of mouldings, ask LOXIT.**

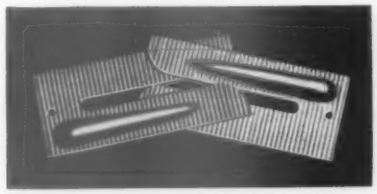
• • • •

BENDING

We are prepared to bend stair nosings, thresholds and other mouldings to dimensions or templates to suit the job. Unusual problems are especially solicited.

LOXIT INTERLOCKING METAL SHIMS

Use **LOXIT Interlocking Metal Shims** for furring strips, floor sleepers, window and door jambs, joists, and other construction items requiring leveling and shimming.



3 gauges: 28, 22, 18

HERE IS HOW THEY WORK

Place Loxit shim on each side of the work that is to be shimmed after fastening same. Shove them together inserting plain leg under crimped leg so as to form the inter-lock. Knock them towards each other as far as necessary to obtain level wanted and drive tight. Slots are provided so as to straddle the nail used in fastening materials to be shimmed providing equal shimming on each side of point of bearing as well as on each side of material.



ADVANTAGES

Loxit shims save time and trouble. There is NO WASTE and NO SHRINKAGE as with ordinary wood wedges or shingles.

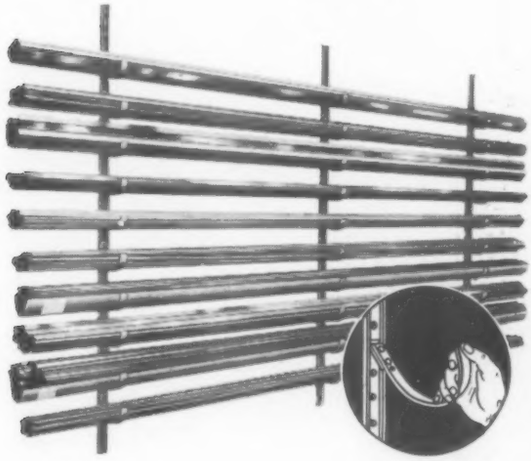


LOXIT ADJUSTABLE STORAGE RACK

Saves Space! Preserves Stock!

USES OF LOXIT STORAGE RACK

Pipe
Tubing
Bars
Flats
Angles and other shapes
Mouldings



Projects only 5⅝" from the wall. Every piece of material is easily accessible. An inventory can be taken in a few minutes. Danger from damage and waste is greatly reduced. Available storage space is multiplied many times.

SPACINGS ARE ADJUSTABLE

In length and height of stand.
In distance between rows of brackets and between standards.
Brackets for special uses on order.

By adding standards horizontally, racks can be any length. . . . By adding to standards vertically, racks can be any height. . . . By spacing standards closer, additional materials can be carried. . . . By spacing brackets closer more numbers can be separately and conveniently stocked. . . . By using special brackets, additional uses are made available. . . .

LITERATURE AND SPECIFICATIONS—Complete Loxit catalogs describing in detail the various Loxit systems and accessories including full sized details, scale drawings and specimen specifications are available upon request.

Loxit

TECHNICAL SERVICE — A staff thoroughly trained in the building business is at the disposal of architects and contractors for the study of unusual problems. This service is offered without obligation. Please consult us.

1217 West Washington Blvd., Chicago 7, Illinois

MILCOR STEEL COMPANY

4029 West Burnham Street, Milwaukee, Wisconsin

Chicago, Illinois · Kansas City, Mo. · Rochester, N. Y. · New York City · Baltimore, Md.



METAL TRIM OF UNSURPASSED BEAUTY AND DURABILITY NOW AVAILABLE WITH INSULMAT SOUND DEADENING

Milcor Metal Trim is the finest interior trim available for modern school construction. Permanence, fire-safety, and resistance to abuse are a few of the reasons why this line has been specified in representative school construction in all parts of the country. Its attractive appearance and exceptional sanitation make it especially adaptable to school use. Every desirable type of interior trim may be found in the complete Milcor line.

The Expansion Wing, which is an optional feature of many Milcor Metal Trim products, provides a permanent plaster bond, preventing checking and cracking of plaster at vulnerable points. And in schools, especially, it is desirable to preserve the original plastered surface.

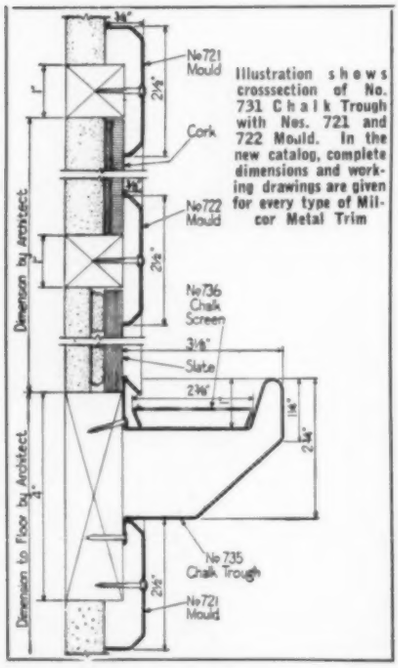
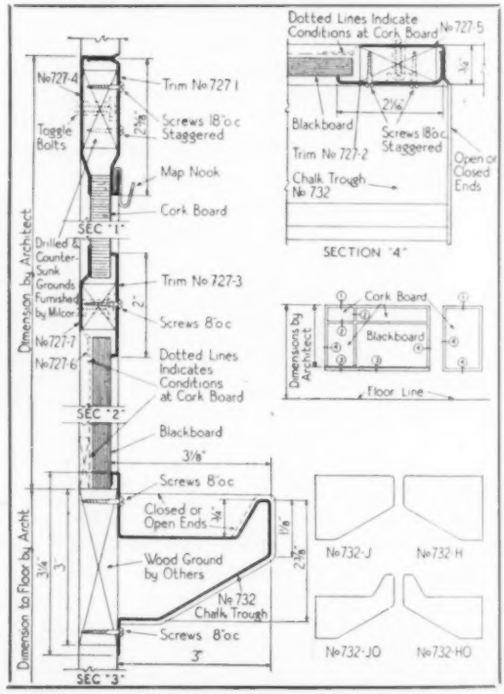


Illustration shows crosssection of No. 731 Chalk Trough with Nos. 721 and 722 Mould. In the new catalog, complete dimensions and working drawings are given for every type of Milcor Metal Trim

Illustration at right shows cross-section view of No. 727 Series Cork Board and Blackboard Trim

Write for the 100-D Milcor Metal Trim Catalog—also for data on Sound Deadening

- **METAL BASES**
- **METAL COVE MOULDS**
- **METAL CHAIR RAILS**
- **METAL BLACKBOARD MOULDS**
- **METAL CHALK TROUGH**



MILCOR PRODUCTS FOR SCHOOLS

MILCOR VENTILATORS

The Milcor "Spinner" Ventilator has great exhaust capacity. The slightest breeze keeps it operating efficiently. As the head revolves, the air in the ventilator is expelled creating a vacuum which draws the impure air from the building.

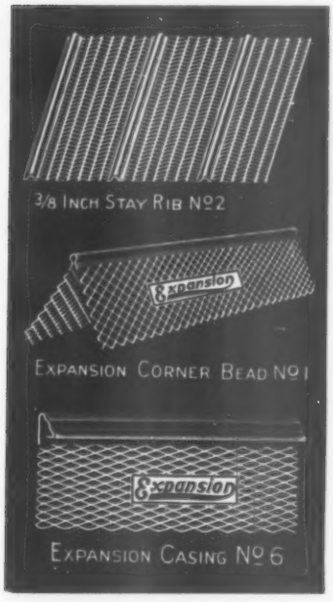
The Milcor Nu-Alpina Ventilator is an actual "air siphon," utilizing natural wind currents to draw unpleasant, impure air from the inside of a building. With its revolving head suspended on a ball-bearing pivot, the Nu-Alpina is as sensitive as a feather to every change in wind direction. The vane at the top of the ventilator is caught by the slightest motion of air, swinging the revolving head so that its opening constantly faces away from the wind. Air motion past the end of the flue creates a natural vacuum, drawing out impure air and preventing down-draft regardless of wind direction.

Send for literature describing and illustrating Milcor Ventilators



Milcor Spinner Ventilator (above)

Milcor Nu-Alpina Ventilator (right)



MILCOR FIRE-PROOF BUILDING MATERIALS

There is no better plaster base for walls and ceilings of school buildings than metal lath. Its scientifically designed mesh gives it a positive plaster grip. There is no plaster waste with this lath, and yet every inch of wall surface is locked permanently into place.

Milcor Expansion Corner Bead is made for outer and inner angles, and its precisely true nose makes a neat, safe, straight line corner. The Expanded Wing, an integral part of the bead, permits the plaster to key through and form a strong bond with the lath beneath, protecting against corner cracks either from blows or strain due to settling.

Expansion Casing provides a practical door and window trim. The flush-type junction of wall and casing insures a sanitary finish, with no cracks to become clogged with dirt.

Write for the Milcor Manual—for complete information on Fireproof Products

MILCOR PARTITION SYSTEMS

These two systems are important contributions to fire-proof construction. The ease with which they can be constructed reduces labor cost considerably and at the same time makes possible partitions of exceptional rigidity and permanence. Certified fire-resistance makes them the partitions for school construction.



Milcor Steel Stud

MILCOR STEEL STUD FOR HOLLOW PARTITIONS

Sound resistance, insulating value, and resistance to shocks and abuse are a few of the outstanding advantages of this system. Write for detailed literature.

MILCOR SOLID PARTITION AND FURRING SYSTEM

Its labor saving simplicity reduces cost and speeds construction. New, improved solid Partition System now being designed for postwar manufacture.

Only three units provide the steel to hold the metal lath in the MILCOR Solid Partition System. These are the Ceiling Angle Runner, the Channel Stud and the Continuous Floor Runner. The Ceiling Runner is attached in position with the Floor Runner directly beneath it. Channel Studs are then slipped into position.

1. Standard Cold or Hot Rolled Channels.
2. Ceiling Angle Runner: Perforated to hold the channel studs in position until wired.
3. Floor Runner: Same as ceiling runner.

SMOOTH CEILINGS SYSTEM

(U. S. Patents Nos. 1,950,422 and 2,000,543)
802 Metropolitan Life Building
Minneapolis 1, Minn.
REPRESENTATIVES IN PRINCIPAL CITIES

A FLAT BEAMLESS UNIVERSAL FLOOR CONSTRUCTION FOR SCHOOL BUILDINGS

Adapted to Reinforced Concrete and Structural Steel Designs by the Modern Method—Elastic Analysis

GENERAL DESCRIPTION—The "Smooth Ceilings" System is normally designed as a 2-way flat slab in accordance with standard building code requirements using the modern method of elastic analysis. The steel column heads or grillages are embedded in the slabs. No concrete caps are required on the columns. The columns may be reinforced concrete, structural steel, steel pipe or cast iron. The floor slabs may be of solid concrete or have light weight blocks or tile fillers embedded in them to reduce dead load and improve plaster bond. Slabs may be built with 2-way joists and removable pans. This system has been used in many important buildings by discriminating architects since 1931. Its practical advantages have been demonstrated in the principal construction centers.

ADAPTABILITY—Because of modern, scientific design methods, the construction is adaptable to irregular column spacing, commonly required in school buildings. It has been successfully used in school and university buildings, with resulting economies in first cost and maintenance.

SERVICES—We license the use of our system by others. We furnish preliminary estimates including quantities of steel and concrete. We suggest suitable framing layouts. We quote delivered prices for steel column heads required. Our engineers are at your service, ready to co-operate. Any qualified structural engineer can design the system.

OUTSTANDING ADVANTAGES AND ECONOMIES

ADEQUATE STRENGTH—Load tests on "Smooth Ceilings" System show very small deflections, good recovery and low stresses in the concrete and steel. **Tested and Approved by Board of Standards and Appeals, New York City and others.**

FLEXIBILITY OF SLAB DESIGN—Floor slabs may be solid concrete or cellular with light weight fillers. Ceilings may be smooth or coffered to suit design requirements. Plaster may be applied directly to the concrete ceiling with or without bond coat, depending on conditions, with resultant cost reduction.

SAVES IN HEIGHT OF BUILDING—The full clear height between floor and flat ceiling may be utilized with usually a saving of several inches in each story height, aggregating several feet in the total height of the average building. Not only are construction costs reduced but operating costs are minimized.

FORMING COSTS REDUCED — The flat deck forms require a minimum amount of cutting and fitting. Therefore the cost of forms for concrete is very low and form lumber salvage exceptionally high.

COST OF AIR CONDITIONING INSTALLATIONS REDUCED — Overhead air conditioning duct work is simply and economically installed. The duct work can be run at will on the flat ceilings. No beams, etc., to dodge. Less height is required.

UNPLASTERED CEILINGS — Where smooth forming materials are used solid concrete ceilings may be acceptably finished and decorated without plaster, a further cost reduction.

SMALLER COLUMN FURRING REQUIRED — Due to design of steel column heads small ducts and pipes can pass through slab close to column shaft.

LOW PLASTERING AND DECORATING COSTS—Because of the complete elimination of beams, girders, drop panels and flared column caps, plastering, decorating and finishing costs are materially reduced both in time and material.

IDEAL LIGHTING CONDITIONS—Since there are no interrupting beams, girders, drop panels, etc., the smooth ceiling expanse assures maximum reflectivity, fewer lighting fixtures and less current consumption.

ACOUSTICS IMPROVED—The all flat ceilings are ideal and economical for acoustic treatment.



Wall span 23 ft., corridor span 20 ft.

Morris Park School, Minneapolis, Minnesota
Board of Education, Architect

Note: Tile fillers in slab; irregular column spacing; rectangular columns; inverted wall beams which permit high window heads. $4,200 was saved on this school by changing from one way concrete joists to "Smooth Ceilings" System plus further annual savings in maintenance costs.

H. H. ROBERTSON COMPANY

2400 Farmers Bank Building, Pittsburgh 22, Pennsylvania — Offices in 50 Principal Cities, World-wide Building Service

Can you name any other

FLOOR SURFACE THAT DOES ALL THIS



1. Repels cockroaches. **2.** Inhibits many  molds and bacteria growths. **3.** Resists foods and kitchen  fats; does not crack or disintegrate in the presence of fats. **4.** Withstands neutral oils and greases  common to machine shops; does not dissolve in these solvents. **5.** Is non-sparking,  nondusting. **6.** Is nondenting under  ordinary point loads. **7.** Is resilient to walk on, yet more than challenges cement and hard-  wood under foot and light-wheeled traffic. **8.** Monolithically applied. No joints. Attractive  colors. Unrivaled as a floor covering for institutions.



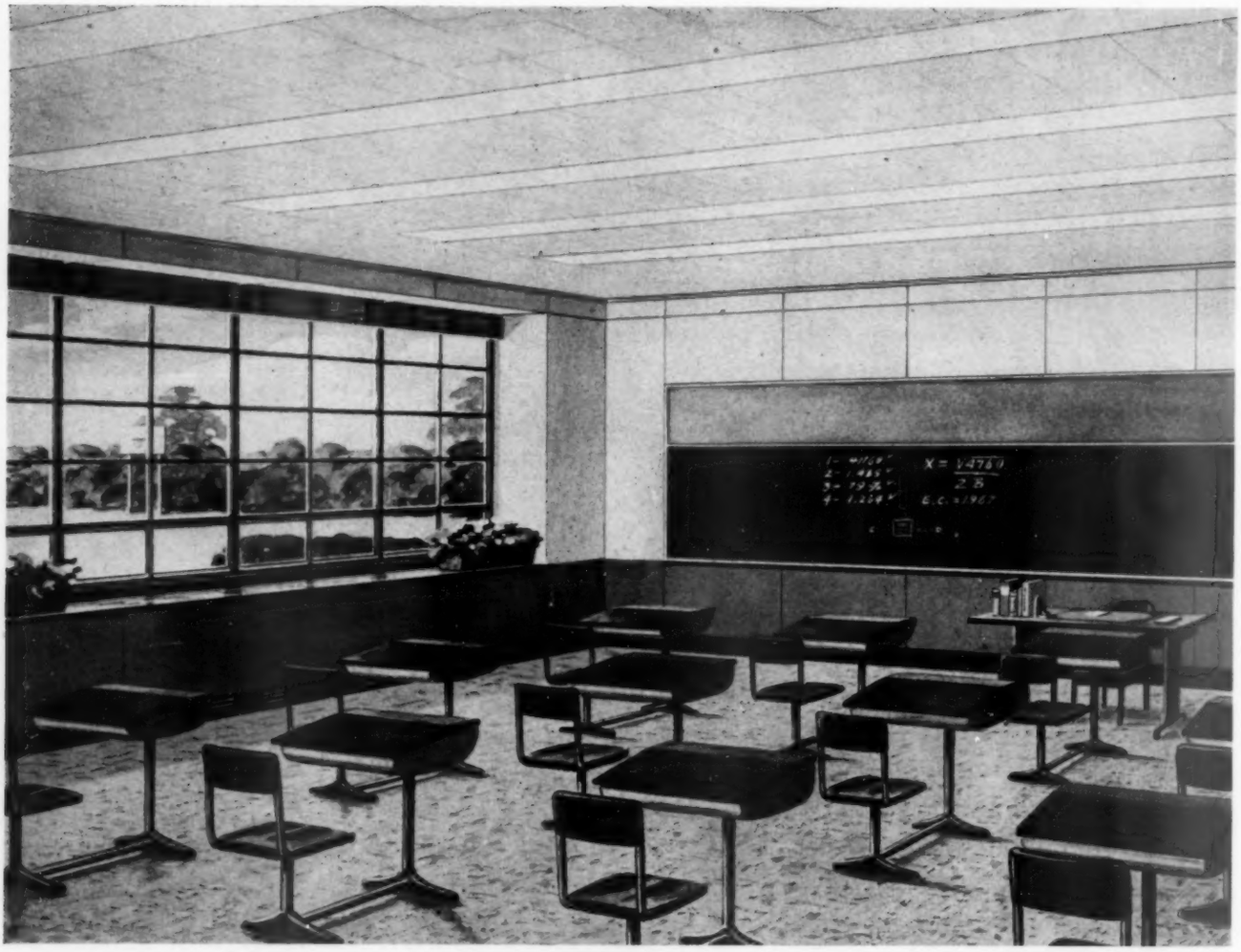
It would be stupid to promote Hubbellite as doing so much, unless it could live up to every claim. We have records of impartial laboratory tests and also of actual installations in hospitals, commercial kitchens, locker rooms, factories. Hubbellite has proved on the job that it does all that we say it does. We will be glad to furnish you with copies of these records. Write H. H. Robertson Co.



JOHNS-MANVILLE

22 East 40th St., New York 16, N. Y. OFFICES IN ALL LARGE CITIES

UNIT CONSTRUCTION FOR SCHOOLS

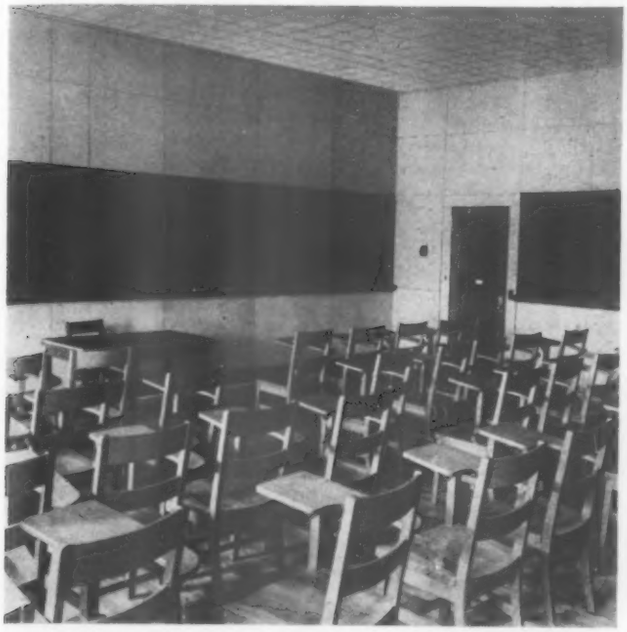


Typical schoolroom built in accordance with the principles of Johns-Manville Unit Construction. Walls are movable Asbestos Transite. Ceilings are J-M Acoustical Units with fluorescent lighting. Floors are colorful J-M Asphalt Tile

THE COMPLETE INTERIOR — WALLS, CEILINGS, FLOORS

The educational needs of any community are ever changing and unpredictable. Often it may become desirable to expand or subdivide schoolroom units or to convert a school from one type to another, as from grade school to junior high, or from academic to vocational. Johns-Manville Unit Construction provides a practical, proved and economic method to give school buildings this needed flexibility.

Three Johns-Manville building materials—Transite Walls—Acoustical Ceilings—Asphalt Tile Floors—are united in Unit Construction. All are under one specification and one manufacturer's responsibility.



J-M Unit Construction was used in this schoolroom at a western university. Note how adaptable it is for the installation of blackboards

J-M TRANSITE MOVABLE WALLS

The keystone of flexibility in Unit Construction is the movable Transite Wall. It can be disassembled and relocated as educational needs require. Made of fireproof asbestos and cement, practically indestructible materials, the movable panels are used not only to form the rigid, double-faced partitions 4" in thickness, but also to finish the interior of the outside walls as well.

J-M ACOUSTICAL CEILINGS

Important factor in helping to overcome the handicap of distracting noise, Johns-Manville Acoustical Ceilings are beneficial both to teacher and student alike. They give the desired degree of quiet for effective teaching, eliminate frequent causes of nervousness, and are proved aids to concentration. An exclusive J-M patented construction system permits interchangeability of flush-type fluorescent lighting and acoustical ceiling units.

J-M ASPHALT TILE FLOORS

J-M Asphalt Tile Flooring completes the Unit Construction System. Made of asbestos and asphalt, the units will withstand the kind of hard wear and abuse that must be expected in any school building. Not only are they durable, J-M Asphalt Tile Floors are pleasantly comfortable and quiet underfoot, thereby reducing the disturbing effects of noisy footsteps in classrooms, corridors, gymnasiums, etc. Individual units permit easy alterations or extensions. Made in a wide variety of plain and marbleized colors.

★ ★ ★

Of course, the three building materials in the System can be used independently, or any two of them can be combined for a particular service. Representatives in Johns-Manville offices, situated in all large cities in this country and Canada, will appreciate the opportunity to consult further with you about Unit Construction or about any of the three building materials which are combined to form the System.

J-M ASBESTOS BUILT-UP ROOFS

As pioneers in the roofing field and manufacturers of a complete line of built-up roofing products, Johns-Manville recommends the Smooth-Surfaced Asbestos Built-Up Roof as the most satisfactory for school service from the double standpoint of economy and fire-protection.

The asbestos felt as used in the J-M Smooth-Surfaced Roof does not support combustion and therefore provides a marked superiority in fire-resistance over the ordinary roofing felt. The protection offered by the smooth-surfaced asbestos roof against roof-communicated fires has been demonstrated many times in actual service.

Furthermore, since asbestos has the durability of stone, long exposure to sun, rain and weather have little effect on these roofs. Rot-proof, they need no periodic coating with slag or gravel. Maintenance costs are correspondingly low. Many Johns-Manville Smooth-Surfaced Asbestos Roofs that were applied 25 and 30 years ago are still giving service with little or no upkeep, testifying to the outstanding economy of this type of built-up roof.

Further details and specifications furnished on request.



Bonded for 10 years—still going strong after 25 years of service! That's the record of the J-M Asbestos Built-Up Roof on the Poly Prep Country Day School, Brooklyn, N. Y. It is typical of the service provided by these better built-up roofs

WOOD CONVERSION COMPANY

Manufacturers of NU-WOOD Interior Finish . . .
and BALSAM-WOOL Sealed Insulation
St. Paul, Minnesota

Balsam-Wool Attic Insulation

Insulating the school attic is a practical measure, first, because of the resultant fuel savings and, secondly, for greater comfort winter and summer. Balsam-Wool, the original Sealed Blanket Insulation, is ideal for schools, as it combines the following qualities which assure lasting efficiency:

1. FUEL SAVINGS. Balsam-Wool is highly efficient—the oldest and best known sealed insulation on the market. Depending on the type of structure in which it is installed, fuel savings as high as 20% may be obtained with it. Balsam-Wool soon pays for itself.

2. YEAR-ROUND COMFORT. Balsam-Wool not only helps keep schools warmer in winter, with less fuel consumption, but also prevents heat penetration in summer, keeping rooms cooler during the hot months. It is available in three thicknesses—Standard—Double Thick—and Wall Thick—to suit every insulating need and condition.

3. PERMANENT. Balsam-Wool is a lasting insulation because it is designed to meet every condition of use. It is completely *sealed* in an asphalt saturated kraft covering—providing double moisture protection. It has double wind barriers to prevent wind infiltration. It is fire resistant and termite-resistant. Its method of application allows important air spaces, which provide additional insulating value.

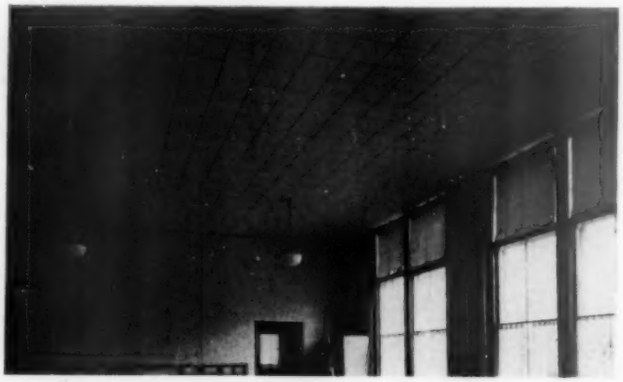
4. EASY APPLICATION. Balsam-Wool is quickly and easily applied. The insulating mat is fastened securely to both liners—liners are fastened securely to framing members. Balsam-Wool cannot settle or pack—will not leave uninsulated spaces. Once applied, Balsam-Wool is a lifetime investment in fuel savings and comfort.

5. MONEY-BACK GUARANTEE. Balsam-Wool Attic Insulation is sold under a money-back guarantee of complete satisfaction—complete assurance that if you are not completely satisfied with your fuel savings and increased summer comfort after a year of use, your money will be refunded. including cost of application.



Nu-Wood Insulating Interior Finish

Nu-Wood Interior Finish is a wall and ceiling covering for all types of schoolrooms. It is available in many sizes, shapes and colors, making possible unlimited design and color combinations. Nu-Wood builds beautiful pre-decorated interiors, provides additional insulation against heat and cold, improves acoustics and reduces noise. Available in tile, plank, board and wainscot, Nu-Wood units are designed to fit together mechanically and harmoniously, the complete job having the following qualities:



1. TEXTURE AND COLOR. A unique textured surface in a variety of fadeproof, harmonious colors which gives walls and ceilings a rich, velvety appearance. A matte surface which reflects light without glare or "Hot Spots."

2. A NEW, EXCLUSIVE JOINT. The tongue and groove eliminates breathing—improves insulation value. The shallow bevel reduces the shadow line in keeping with today's interior decoration technique.

3. INVISIBLE NAILING made possible by the new Nu-Wood Clip System.

4. THERMAL INSULATION. Nu-Wood brings added insulation to the school buildings, helping further to reduce fuel bills in winter and providing greater coolness in summer. Thermal conductivity .324.

5. NOISE ABSORPTION VALUE. Nu-Wood absorbs sound, quiets noise, improves hearing.

6. EASY APPLICATION. Nu-Wood can be applied directly over cracked plaster or other disfigured walls. Equally adaptable to new or old construction. It requires no maintenance, may be cleaned with a rubber sponge.

7. LOW COST. With these advantages—decoration, acoustical treatment and insulation—Nu-Wood is surprisingly low in cost.

KOLOR-TRIM MOLDINGS. The decorative wood molding especially designed to harmonize with the various Nu-Wood shades.

NU-WOOD STA-LITE. A light reflective form of Nu-Wood, with a light reflection of 76%. Sta-Lite has the unusual faculty of actually becoming lighter with use.

FURTHER INFORMATION ABOUT BALSAM-WOOL ATTIC INSULATION AND NU-WOOD INSULATING INTERIOR FINISH WILL BE SENT ON REQUEST

ASPHALT TILE-TEX TILE

TILE-TEX ASPHALT TILE FLOORING IN SCHOOLS



CLASSROOM, PEABODY DEMONSTRATION SCHOOL, NASHVILLE, TENN.

THE TILE-TEX COMPANY, INC.
ASPHALT TILE MFR.

CHICAGO HEIGHTS, ILLINOIS

SUBSIDIARY OF THE FLINTKOTE COMPANY

TILE-TEX ASPHALT TILE FLOORING

A Time-Tested School Flooring

Tile-Tex Asphalt Tile is an asbestos-asphalt composition tile flooring, which has been used for twenty years in schools throughout the United States. Tile-Tex Asphalt Tile floors give uniformly good service, represent on the average a low investment cost per square foot, and are maintained simply and economically. They represent what we honestly believe to be the greatest value in floors for schools that can be purchased today.

Tile-Tex Asphalt Tile is designed and manufactured to meet the demand for a low cost flooring, installed in tile size units, that will withstand heavy foot traffic under exacting conditions over a long period of years. Prominent school architects throughout the nation specify Tile-Tex Asphalt Tile consistently and know from experience that the company manufacturing it can be relied upon to stand behind the material and improve it year after year.

On these pages are photographs showing Tile-Tex Asphalt Tile in use in many of the various types of areas found in schools today. Tile-Tex Asphalt Tile is often specified because of this versatility and adaptability to a wide variety of uses. It is manufactured in a great variety of sizes and colors, enabling the creation of designs to suit almost any color scheme and design objective. Hundreds of Tile-Tex Asphalt Tile installations in schools throughout the country are mute testimony to the quality of the product and the knowledge and skill of the Tile-Tex Asphalt Tile contractors who install it.

Constructive criticism and suggestions on the part of school executives are always welcomed by the company, which is constantly ready to help in the solution of any problems connected with school floors.



CLASSROOM, RIVERHEAD HIGH SCHOOL, RIVERHEAD, N. Y.

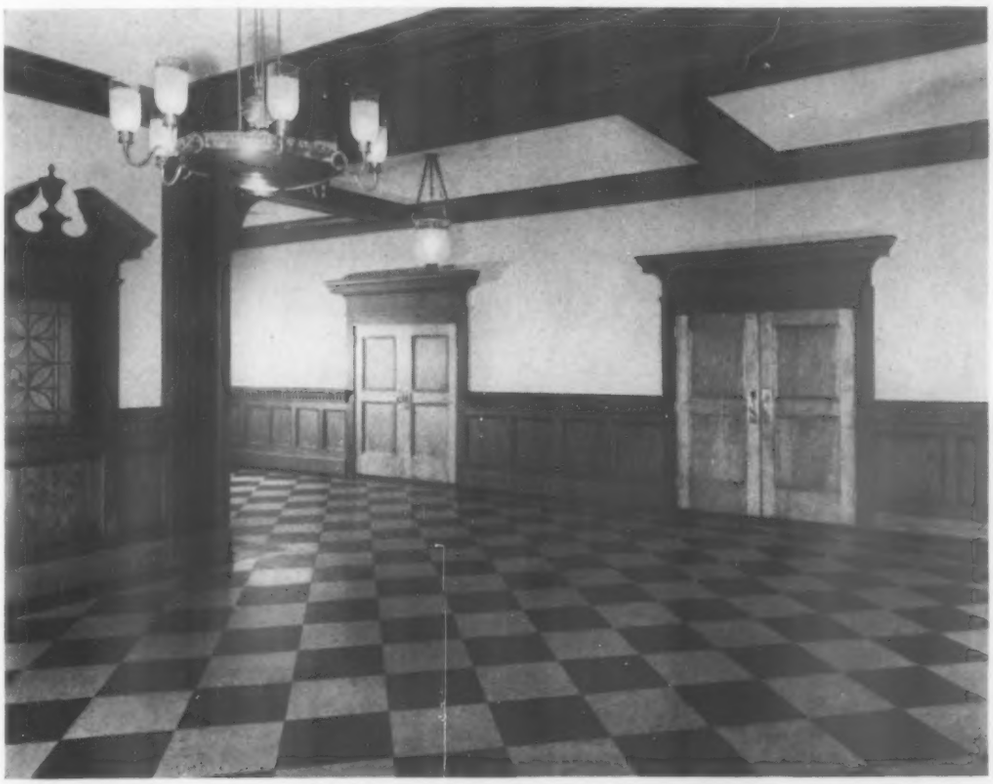
Low Maintenance Cost



LOUNGE, WILLARD HALL, NORTHWESTERN UNIVERSITY, EVANSTON, ILL.

Ideal for Work or Play

TILE-TEX ASPHALT TILE FLOORING



Durable Sanitary Attractive

TILE-TEX ASPHALT TILE FLOORS ARE SAFE, ATTRACTIVE, DURABLE, AND EASY TO CLEAN. THESE CHARACTERISTICS ARE PARAMOUNT IN SCHOOL CORRIDORS

THE ATTRACTIVE TILE-TEX ASPHALT TILE FLOOR SHOWN BELOW LENDS CHARACTER AND DISTINCTION TO THIS LIBRARY





"Foot-easy"

THIS HOME ECONOMICS ROOM FLOOR IS COMFORTABLE UNDER FOOT AND HAS A SANITARY, EASY-TO-CLEAN SURFACE

TILE-TEX ASPHALT TILE FLOORING

Meets Requirements in All Areas

Tile-Tex Asphalt Tile possesses the necessary performance characteristics required for school corridors, classrooms, restrooms, auditoriums, libraries, science rooms, cafeterias, and offices. Tile-Tex Asphalt Tile combines comfort under foot with the ability to withstand severe traffic and give many years of satisfactory service. Inherently moisture-resistant, Tile-Tex Asphalt Tile is successfully installed in areas on and below grade over concrete sub-floors. When unwaxed, Tile-Tex provides a safe, sure footing on which to walk and work. Its smooth, closely textured surface is easy to keep clean and sanitary. The asbestos content of Tile-Tex Asphalt Tile makes it substantially incombustible and places it high in the ranks of resilient flooring as to fire resistance.

Tile-Tex Asphalt Tile is available in thirty-six plain and marbleized colors. Careful designing of these colors enables the judicious selection of colors to meet specific requirements of each school area.

Tile-Tex Asphalt Tile is manufactured in two thicknesses, 1/8" and 3/16", and in the following sizes: 3 x 3 in., 6 x 6 in., 6 x 12 in., 9 x 9 in., 12 x 12 in., 12 x 24 in., and 18 x 24 in. To supplement these sizes and permit modern, striking designs, there are available feature strips in multiples of 1/2 in., from 1 in. to 3 in. Special decorative inserts for achieving individuality of design are also obtainable.

Partial List of School Installations

The Franklin D. Roosevelt High School, Bremerton, Washington
Cornish School, Seattle, Washington
Lake City Grade School, Seattle, Washington
Newburyport High School, Newburyport, Massachusetts
Duxbury High School, Duxbury, Massachusetts
Davol School, Fall River, Massachusetts
Bowditch School, Salem, Massachusetts
Providence St. School, Worcester, Massachusetts
Howard University, Washington, D. C.
Georgetown University, Washington, D. C.
Lee Jackson School, Fairfax County, Virginia
St. Paul's Academy, Washington, D. C.
Leland Junior High School, Bethesda, Maryland
Catonsville High School, Catonsville, Maryland
Johns Hopkins University, Baltimore, Maryland
St. Mary's High School, Akron, Ohio
Akron University, Akron, Ohio
Barbarton High School, Barbarton, Ohio
Boy's Catholic High School, North Side, Pittsburgh, Pennsylvania
The Cronbrook School, Detroit, Michigan
York School, Dearborn, Michigan
University of Detroit, Detroit, Michigan
University of Michigan, Ann Arbor, Michigan
Dominican High School, Detroit, Michigan
University of Pittsburgh, Pittsburgh, Pennsylvania
Carnegie Tech, Pittsburgh, Pennsylvania
Toledo University, Toledo, Ohio
Del Barton School, Morristown, New Jersey
Sacred Heart Academy, Stamford, Connecticut
Holy Trinity School, Brooklyn, New York
Blair Academy, Blairstown, New Jersey
Mt. Carmel School, Utica, New York
Mattituck School, Mattituck, New York
Port Washington High School, Port Washington, New York
New York University, New York, New York
Ethel Walker School, Simsbury, Connecticut
Washington Irving High School, New York, New York
St. Vincent's School, Buffalo, New York
Scarsdale High School, Scarsdale, New York
University of Connecticut, Storrs, Connecticut
Point Loma Junior High, San Diego, California
San Diego Army-Navy Academy, Carlsbad, California
Grossmont Union High, Grossmont, San Diego County, California
El Monte Union High School, El Monte, California
Thomas A. Edison School, Long Beach, California
Huntington School, San Marino, California
Riverside Drive School, Van Nuys, California
United Township High School, East Moline, Illinois
Milan Public School, Milan, Illinois
Augustana College and Theological Seminary, Rock Island, Illinois
University of Illinois, Champaign, Illinois
Illinois Institute of Technology, Chicago, Illinois
George Williams College, Chicago, Illinois
Hinsdale Township High School, Hinsdale, Illinois
Bloom Township High School, Chicago Heights, Illinois
University of Florida, Gainesville, Florida
Florida State Teachers, Tallahassee, Florida
Emery University, Emery, Georgia
Louisiana State University, New Orleans, Louisiana
University of Oklahoma, Norman, Oklahoma
Washington University, St. Louis, Missouri

THE TILE-TEX COMPANY, INC.
ASPHALT TILE MFR.
CHICAGO HEIGHTS, ILLINOIS
SUBSIDIARY OF THE FLINTKOTE COMPANY

SERVICISED PRODUCTS CORPORATION

Manufacturers and Distributors

BUILDING AND CONSTRUCTION PRODUCTS

6051 West 65th St., Chicago 38, Ill.

REPRESENTATION IN PRINCIPAL CITIES

Servicised Products Corporation—Manufacturers and Distributors for the past Quarter Century—Leaders in highly Specialized fields of Waterproof Expansion Joint Fillers for Concrete Construction—Makers of Waterproof Compound for Roofing Maintenance—Also Floor Coverings of Cork-Rubber Tile and Asphalt Plank and other materials.

ASPHALT PLANK FLOORING

SERVICISED ASPHALT PLANK has the qualities of being very tough, resilient and long wearing, capable of withstanding continuous heavy freight trucking in buildings of all types. It does not crack or crumble thus eliminating the annoyances usually found in noisy, dusty concrete floors. It is a positive guard against the usual flaws which develop in wood floors, as it will never split, absorb moisture, rot or decay. It is resistant to fire, acid and many abuses found most prevalent around industrial plants.

EASY TO LAY — CEMENT TO CONCRETE, NAIL TO WOOD



ASPHALT PLANK FOR STORAGE ROOMS, BASEMENT FLOORS, ENGINE OR TOOL ROOMS, SHOPS, ETC.

LAYING OF SERVICISED ASPHALT PLANK is found to be very simple. It may be nailed to any fairly smooth wood floor—old, or new, or cemented to concrete, asphalt, or metal floors. Standard Plank comes in lengths from 2 to 10 feet. Widths of 6 to 12 inches—thickness varying from one half to two inches.

MINERALIZED ASPHALT PLANK is similar to the standard except it has imbedded in the upper surface a generous scattering of crushed rock smoothed down under pressure but sufficiently exposed to give greater traction on approaches, platforms, etc., to counteract any tendency toward skidding. Extra weight is only about 50 lbs. per 100 sq. ft.

SERVICISED EXPANSION JOINT FILLERS

PREMOLDED CORK EXPANSION JOINT . . . A joint filler that is ideal for construction where a resilient, non-oozing type of expansion is required. We recommend this joint for the construction of dams, swimming pools, reservoirs, bridges and highways.

PREMOLDED SELF-EXPANDING CORK EXPANSION JOINT . . . An efficient joint filler especially designed for concrete slabs that contract beyond their original set.

PREMOLDED FIBER EXPANSION JOINT . . . An excellent product for extrusion control. The non-oozing feature makes this joint appropriate for use in monolithic construction of concrete, including street and highway paving.

PREMOLDED ASPHALT EXPANSION JOINT . . . This joint filler is considered standard and is generally used when special conditions do not require the use of other types.

FOR ROOFING MAINTENANCE

Para-Plastic — EXTENDABLE — MAINTAINS BOND at ZERO

©-1945

PARA-PLASTIC STOPS MAJOR LEAKS AND OPENING SEAMS BOTH SUMMER AND WINTER . . . Para-Plastic, as a hot-poured Roofing Compound, holds its elasticity permanently through all seasons, and variations of temperature.

1. Para-Plastic is indispensable for critical points in roofing as it holds an even, determinate and unbroken seal.
2. Para-Plastic is used as an effective and lasting adhesive for all types of flashing.
3. Forming a perfect bond for topping blocks on coping, parapets or stone walls.
4. Complete protection for sealing cracks and crevices around trap drains, downspouts, etc.
5. Assurance of positive seal against seepage around base of chimneys; also apply at top of chimney to prevent erosion.
6. Skylights are made fast and secure by use of Para-Plastic against any infiltration of dust or moisture.
7. Metal vent pipes are no longer a source of annoying leaks when sealed once and for all with Para-Plastic.

SERVICISED CORK-RUBBER TILE — AN UNSURPASSED FLOOR COVERING



CORK RUBBER TILE . . . is an attractive flooring, especially long wearing where heavy foot-traffic is encountered; easily cleaned, resilient and noiseless. It is used in Libraries, Offices and Hallways of Schools, Colleges and Universities; excellent for rest rooms, entryways, and restaurants, also used for Hotels, Theatres, Railway and Airport Stations, unexcelled for beauty, wear and cleanliness.

FLOR-LAY, a remarkable innovation in the manner of laying Rubber Tile or linoleum, eliminates several time-worn, laborious operations. Easy laying saves time and labor costs. Servicised Flor-Lay (Pat. applied for) is a pliable plastic waterproof sheet (in convenient rolls) adhesive on both sides, easily laid smooth, firm, and resilient. An ideal permanent base for new or old, wood or concrete, floors.

THOS. MOULDING FLOOR MFG. CO.

EXECUTIVE OFFICES

165 West Wacker Drive, Chicago 1, Ill.

DISTRICT SALES REPRESENTATIVES IN ALL PRINCIPAL CITIES

THOS. MOULDING

Moultile

Flexible Reinforced MASTER ASPHALT TILE

Moultile Master Asphalt Tile combines all the qualities desirable for school floors. It is highly decorative, quiet underfoot, and has a pleasant resilience and elasticity. Moultile is low in original cost, and exceptionally low in maintenance cost.

Durability is an outstanding characteristic of Moultile Asphalt Tile. Millions of scuffing, scraping feet will cause no perceptible wear . . . will not affect color and texture which are uniform throughout. Moultile, therefore, requires no expensive periodic refinishing.

Moultile is ideal for classrooms, corridors, and lobbies. In gymnasiums it yields a secure footing which does not tire contestants or cause floor burns and may quickly be waxed for dancing.

Reinforced for Extra Strength

Because of its strength Moultile can now be applied, even in the 1/8 inch thickness, over firm, smooth wood subfloors with results heretofore expected only of asphalt tile over cement. It is truly inert and remains permanently bonded to subfloor. Because of its flexibility, Moultile quickly seats itself to the underfloor, permitting immediate use after installation.

Ideal for Basement Floors

Moultile and the asphalt cement in which it is laid are impervious to the alkali and dampness always present in cement resting on the ground, which destroy other types of flooring. Moultile bonds permanently, does not buckle or loosen and will not rot or decompose. It solves the problem of flooring over cement resting on the ground.

Many Colors and Sizes

Moultile is available in twenty rich colors, plain and marbleized. Thicknesses: 1/8 or 3/16 inch. Sizes: 9 x 9, 12 x 12, and 18 x 24 inches.

PRODUCTS OF THOS. MOULDING . . .
Floors, Walls, Treads, Trim . . . *from Plastics*

FLOORS

Tile
- Moultile
- Greaseproof
- Acid-Resistant
- Non-slip Safety

Troweled-on
- TMB
- Moulstone
- Asphalcrete Underlayment
- Magnesite Underlayment

PLASTIC SPECIALTIES
- Moultread Stair Tread and Nosing
- Flexedging
- Flextread

WALLS and WALL BASES
- Moultile Walls
- Greaseproof Walls
- Acid-Resistant Walls
- Flexible Cove Base
  - Butt Type
  - On-top Type
- Flexible Straight Base

MAINTENANCE MATERIALS
- Permagloss Self-polishing Wax
- Sweepolene Sweeping Compound
- Kleenolene Non-caustic Soap

INSTALLATION

Thos. Moulding and other approved flooring contractors contract to install floors anywhere in the United States and nearby countries. Write for samples and complete technical information on Moultile and the Company's other products, listed above.

THOS. MOULDING

Greaseproof

TILE

Thos. Moulding Greaseproof Tile resists the grease and oils that discolor and soften other floor coverings. It is ideal for domestic science rooms, kitchens, cafeterias, and machine shops. This flooring has the same resilient buoyancy, the same high strength and other characteristics of Moultile.

THOS. MOULDING

Acid-Resistant

TILE

Thos. Moulding Acid-Resistant Tile is a specially formulated Moultile for giving maximum resistance against acidic and alkaline chemicals which are harmful to other types of floor coverings. It is recommended for laboratory installation and for lavatories. It has all the other characteristics of Moultile . . . durability, underfoot comfort, etc.

MAINTENANCE MATERIALS

Good floors deserve good care. The following maintenance materials, specially developed for use on Moultile, are recommended as being safe, efficient and economical for use on all floor coverings.

Permagloss—A bright-drying, self-polishing liquid floor wax which contains no oil, grease or other harmful solvents.

Kleenolene—A non-caustic liquid soap which will not injure floors or finishes.

Sweepolene—A sweeping compound made with wax instead of the oil found in commercial compounds.

Thos. Moulding Moultile lends itself to interesting special designs like this lobby in the Wilmette, Ill., school. CHILDS & SMITH, Architects



Thos. Moulding Acid-Resistant Tile provides a comfortable floor that takes the spillage and the wear in this laboratory at State Agricultural College, Raleigh, N. C. GEORGE WATTS CARR, Architect



THOS. MOULDING

Wall Tile

A beautiful, enduring wall treatment which requires no periodic refinishing.

Thos. Moulding Wall Tile is a permanent wall finish which may be installed over smooth plaster. The use of Thos. Moulding Wall Tile eliminates, once and for all, the periodic cost of papering, painting, calcimining, etc. Only an occasional washing is needed. Waxing produces a rich, glossy finish. It is strong, durable, non-absorbent, sanitary and fire-resistant.

Thos. Moulding Standard Wall Tile is made from the same type of materials and is fabricated by the same process as Thos. Moulding Moultile. Where special protection is required, however, Thos. Moulding Wall Tile is also available in Acid-Resistant and Greaseproof types.

Thos. Moulding Wall Tile is made in ⅛ in. thickness only. Standard Wall Tile is available in the same range of colors and sizes as Moultile.

THOS. MOULDING DECORATIVE

Flexible Base

Thos. Moulding Flexible Base is an economical, sanitary and highly decorative base for use with asphalt tile, linoleum, linoleum tile, rubber, cork, etc. It is exceptionally strong, and being so flexible, conforms readily to wavy walls and is easily bent around corners and pilasters. It is available as Butt Type or On-top Type Cove Base or as Straight Base and can be furnished to match all colors of Moultile.

THOS. MOULDING

Safety Tile

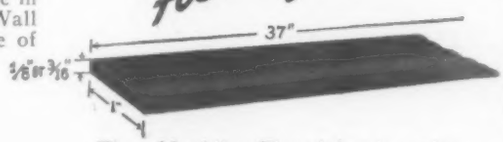
Provides positive, non-slip undertoot safety, even when wet.

Thos. Moulding Safety Tile is a floor tile in which non-slip chips, incorporated during the manufacturing process, give it a surface appearance similar to terrazzo and positively eliminate the slip hazard, even when the floor is wet. Thos. Moulding Standard Safety Tile has all the other characteristics of Moultile and is similarly installed. It is also available in the Acid-Resistant and Greaseproof types.

Thos. Moulding Safety Tile is now widely used in front of elevators, on stair treads, under revolving doors, and in vestibules, stair entrances, ramps, etc., wherever safety is essential.

THOS. MOULDING

Flexedging



Thos. Moulding Flexedging is a plastic molded strip used for abutting floors of asphalt tile, linoleum, etc., at doorways or elsewhere. By turning it upside down, Flexedging can also be used to make a neat juncture between the floor covering and cement coves.

Flexedging is extremely flexible and inert, will lie flat of its own weight without rattling, and quickly conforms to irregularities in the floor. No screwing is required, as Flexedging will adhere with the same cement used for asphalt tile, rubber or linoleum. Standard 37 inch lengths fit across most doorways, and can easily be cut to exact size. Furnished in black only. See diagram above for dimensions.

THOS. MOULDING

Moulstone

COMPOSITION FLOORING

Thos. Moulding Moulstone is a plastic composition troweled on subfloors to form a smooth, seamless, sanitary surface. Because of its great strength, Moulstone is especially valuable for converting old wood floors . . . even those in poor condition . . . into new floors which are safe, attractive, comfortable and easily kept clean. The usual application raises existing floor levels only ½ inch and adds little weight.

Moulstone is low in cost, and ready for use almost immediately. It can be paneled and banded in different color combinations or scored to resemble tile. Moulstone is fireproof, resists oil and grease, and can be made non-slip by sprinkling in non-slip aggregates.

Moulstone has the unusual property of inhibiting development of the fungus which causes athlete's foot. It is therefore recommended for use in locker rooms, toilets and areas surrounding showers. A special water-proof type of Moulstone is available for use within shower stalls.

THOS. MOULDING

Underfloor

TREATMENTS

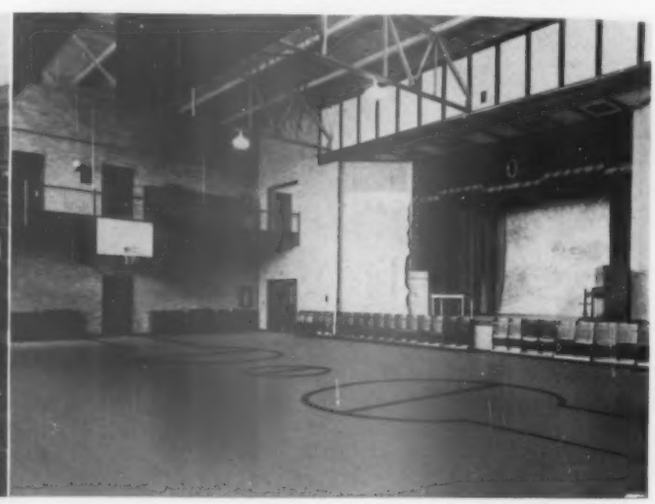
Virtually any old cement or wood floor, no matter how bad its condition, can be made into a suitable foundation for floor coverings through the application of Thos. Moulding Asphalcrete and Magnesite Underlayments and Quicksmoother. These materials have been specially developed by Thos. Moulding to smooth and strengthen subfloors that are cupped, cracked, uneven or springy.

Thos. Moulding also specializes in the repair of magnesite and mastic floors.

Hard-wearing, easy-walking Moultile provides a quiet, attractive floor for the library of the Catskill School, Catskill, N. Y. ERNEST SIBLEY, Architect.

This installation at Community High School, Ohio, Ill., is sixteen years old and is still giving satisfactory service. The game lines are inlaid with Moultile in suitably contrasting colors . . . never fade, never need repainting.





AMERICAN ABRASIVE METALS CO.

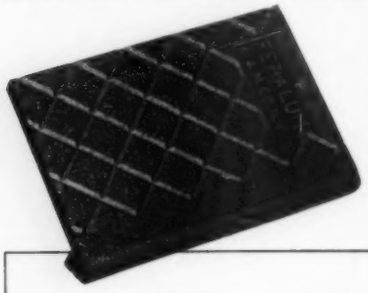
IRVINGTON 11, N. J.

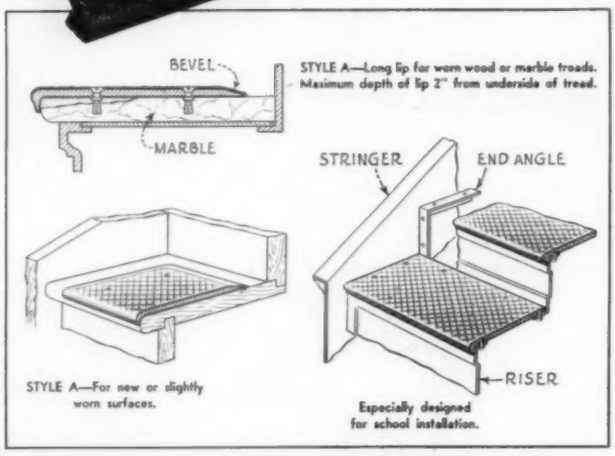
Offices in Principal Cities

ANTI-SLIP PRODUCTS FOR FLOORS, STAIRS, RAMPS AND WALKWAYS

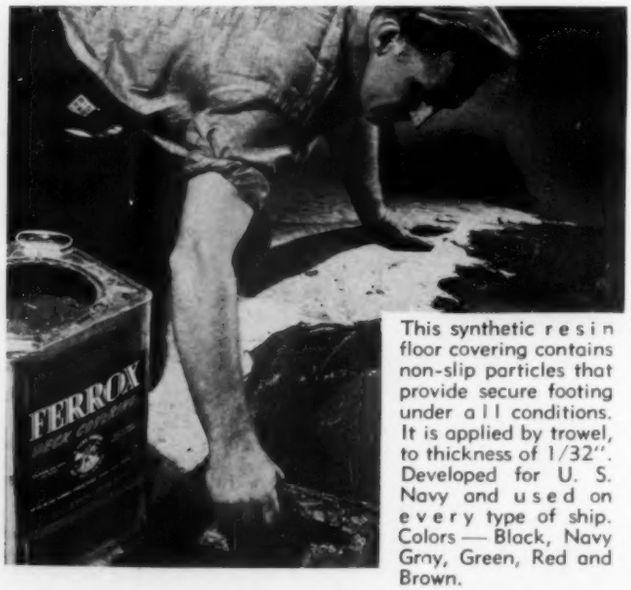
FERALUN ANTI-SLIP TREADS

For more than a quarter-century, Feralun Anti-Slip Treads have provided safe footing on the stairways of schools and universities throughout the country. More than 1900 schools were Feralun-equipped in a period of 5 years. In addition to safety, Feralun Treads provide economy. They require no maintenance and normally last for the life of the building itself. For your school stair treads, floor plates or door saddles specify "Feralun Anti-Slip Treads." Catalog upon request, or see Sweets Architectural File, Section 13A/9, 1945.



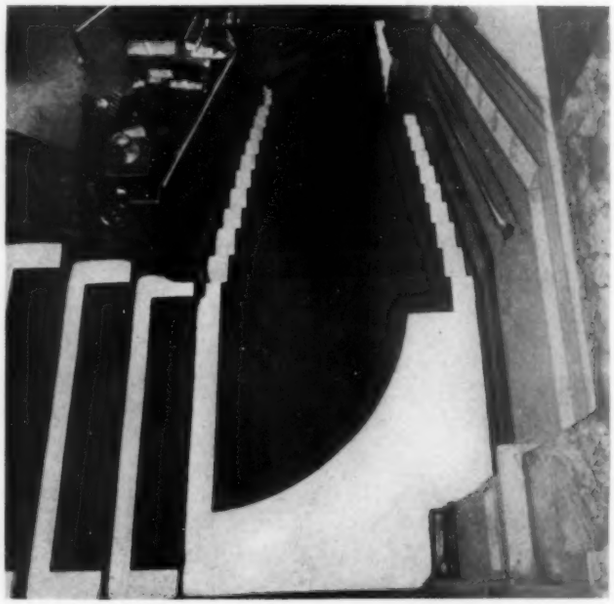


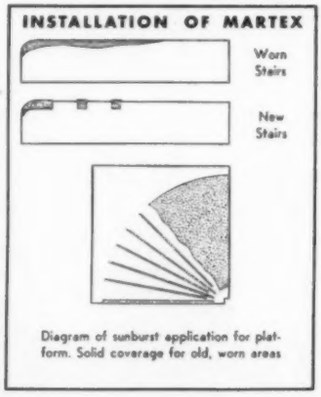
FERROX NON-SLIP COMPOSITION



This synthetic resin floor covering contains non-slip particles that provide secure footing under all conditions. It is applied by trowel, to thickness of 1/32". Developed for U. S. Navy and used on every type of ship. Colors — Black, Navy Gray, Green, Red and Brown.

ANTI-SLIP MARTEX





Martex is a plastic composition having a high percent abrasive aggregate. On new or only slightly worn stairways it is applied in recessed strips along the nosing and tread surface. It provides complete protection against slipping and checks stair wear. Badly worn treads can be restored to original contour with Martex spread over entire worn area. Martex is extremely durable and bonds perfectly to wood, stone and concrete. Applied only by our own mechanics located in principal cities.

FERA-FLOW NON-SLIP FLOOR PAINT

Fera-Flow provides a quick, low-cost method of slip-proofing walkways. This product is a high-grade floor paint containing non-slip particles and is non-slip wet, oily or dry. Fera-Flow will out-wear ordinary painted surfaces and is just as easy to clean. Available in colors: Gray, Green and Red.



WE HAVE THE PRODUCT TO CORRECT YOUR SLIPPING HAZARD . . . WRITE GIVING DETAILS OF YOUR PROBLEM

AMERICAN MASON SAFETY TREAD CO.

Lowell, Mass.

REPRESENTATIVES IN PRINCIPAL CITIES OF THE UNITED STATES AND CANADA

M A S O N

Abrasive Metal — Ribbed Type
SAFETY TREADS

For Stairways, Stair Landings and Ramps

Over Fifty Years of Service to Educational Institutions

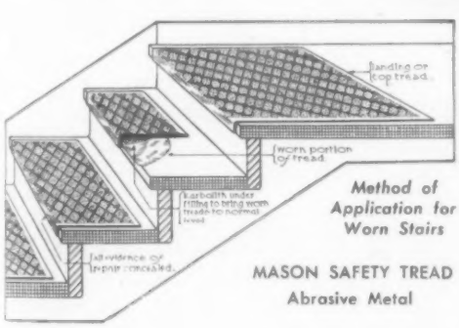
POSTWAR plans for extensive school building repairs now being formulated include many stairways, entrances and other heavy-traffic walkway surfaces on which repairs were necessarily neglected during the period of materials restriction.

For years **Mason Safety Treads** have filled a very definite need on stairways and other surfaces of slate, wood, concrete or other construction. With Mason Treads, whether you install the Abrasive Metal or the Ribbed Type, your SAFETY problem will be satisfactorily solved. Either type can be quickly and economically installed by your own workmen.

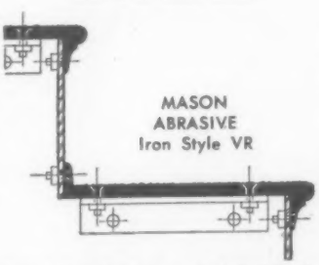


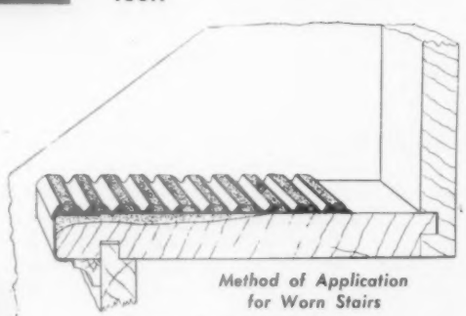
When you specify MASON products, you are assured of receiving *individualized* attention to your particular problem, intelligent engineering service, and a quality product at a fair price.

Write for copy of the MASON catalog—sent free on request to any school official or architect.



Above and Below—
SELF-SUSTAINING TREADS
Used with Steel Risers





SPECIFICATIONS—SAFETY TREADS

New Steel Construction — All stair treads and platforms as shown on plans shall be Mason Abrasive Iron Style VR (or other style as selected) with cross-hatched (plain or fluted if preferred) surface as manufactured by the American Mason Safety Tread Co., Lowell, Mass. Suitable steel supports and stringers with carrier angles shall be provided for securely bolting treads and platforms in place. Sheet steel riser plates (state gauge) shall be bolted to nosings and riser lips of the Safety Tread. Thickness of treads and platforms shall conform to the manufacturer's established standards.

New Concrete or Pan Filled Construction — All stair treads including floor and landing level steps shall be provided with Mason Abrasive Iron Safety Treads Style M (H or G) cross-hatched surface as manufactured by the American Mason Safety Tread Company, Lowell, Mass. (Mason Ribbed Type Steel Base Abrasive Filled Safety Tread, Figure 1A, 2A, 4 or 5 may be substituted.) Safety treads shall be 6 (4, 3½ or 3) inches wide overall and extend from stringer to stringer (for reinforced concrete construction safety treads may extend to within 3 inches of stringers). Standard concrete anchors, spaced according to manufacturer's recommended practice, shall be used to secure safety treads in place.

TYPICAL MASON EDUCATIONAL INSTALLATIONS

HARVARD UNIVERSITY
Cambridge, Mass.
MONTREAL WEST HIGH SCHOOL
Montreal, P. Q.
BROWN UNIVERSITY
Providence, R. I.
PROVINCIAL NORMAL SCHOOL
Fredericton, N. B.
CULVER MILITARY ACADEMY
Culver, Indiana
UNIVERSITY OF MINNESOTA
Minneapolis, Minn.
U. S. MILITARY ACADEMY
West Point, N. Y.
U. S. NAVAL ACADEMY
Annapolis, Md.
UNIVERSITY OF FLORIDA
Gainesville, Fla.
PRINCETON UNIVERSITY
Princeton, N. J.
LOUISIANA STATE UNIVERSITY
Baton Rouge, La.
WILLIAMS COLLEGE
Williamstown, Mass.

AND HUNDREDS OF OTHERS

WOOSTER PRODUCTS, INC.

36 Spruce Street
Wooster, Ohio, U. S. A.

REPRESENTATIVES IN ALL PRINCIPAL CITIES

Safety Treads · Elevator Sills · Window Sills · Curb Bars ·
All Steel Safe-Groove Treads for Steel Stair Construction

Free Footsteps From Fear With WOOSTER *Safety Treads*

Over 16% of All Student Accidents in School Buildings Occur on Stairs

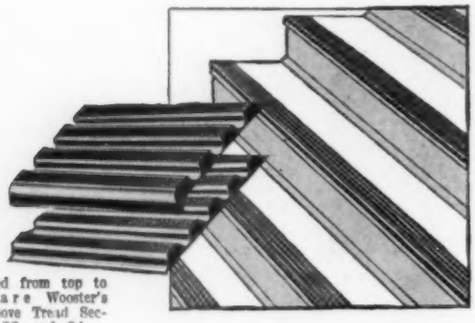
Out of an experience extending well over 20 years, Wooster Products, Inc., has furnished Safety Treads for over 86,000 installations, hundreds of which have been in educational buildings and stadiums. Wooster Engineers have designed a Wooster Safety Tread to meet every requirement of safety, economy and beauty to a degree usually overlooked by those lacking Wooster's long experience.

IN NEW BUILDINGS INSTALL WOOSTER SAFETY TREADS ON STAIRS AND RAMPS FOR

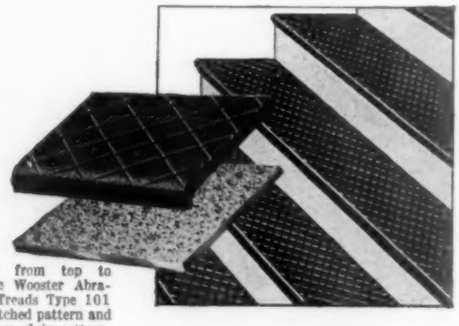
Safety—Safety should be the first consideration in the design of any walkway. Wooster Safety Treads have been designed to lessen all slipping hazards. Laboratory tested materials are used to provide the highest degree of anti-slip protection possible. Wooster Safety Treads are not ordinarily affected by water, oily substances or icing.

Appearance—Wooster Safety Treads give assurance that there will be no ugly down-at-the-heel appearance to stairs or other walkways, even after considerable wear. Wooster Treads add materially to the attractiveness of all stairs—even the beauty of such fine materials as marble.

Economy—Safety is priceless. The first cost of Wooster Safety Treads is a mere fraction of a percent of the total cost of a building. Yet the installation of Wooster Safety Treads may save thousands of dollars by preventing injuries due to falls. The hard, wear-resistant, anti-slip properties endure with little or no care for many years and are easily replaced if ever worn out.



Illustrated from top to bottom are Wooster's Safe Groove Tread Sections 33 and 34.



Illustrated from top to bottom are Wooster Abrasive Cast Treads Type 101 in cross-hatched pattern and Type 100 in plain pattern.

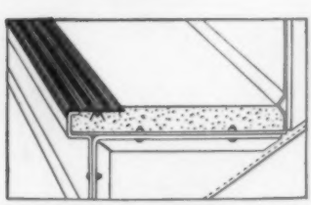
WOOSTER SAFE-GROOVE TREADS

These treads made of steel, yellow brass or white alloy bases give stairways an ultra modern appearance that is unsurpassed in appearance. Positive anti-slip protection is furnished by either an abrasive filler with grits embedded not less than 1/16 inch, or by a lead filler which has long been recognized as an ideal safety tread material. These treads are as well suited for repairing stairs as for new stairways.

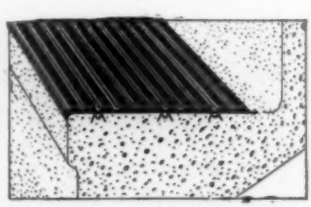
WOOSTER ABRASIVE CAST TREADS

Wooster Abrasive Cast Treads are built for durability and require little maintenance. Abrasive grit is integrally cast into the metal matrix to a minimum depth of 1/16 inch and is unaffected by oil, soap or other lubricants. These treads are made in four different metals. Ferrogrit (Cast Iron) Safety Treads are cast from high grade iron of pearlitic structure developed after years of metallurgical research and especially suitable for safety tread service. Other safety tread materials are Bronzogrit (bronze), Alumogrit (aluminum) and Nicklogrit (nickel).

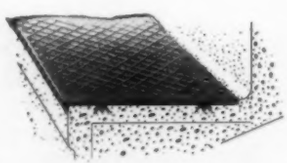
APPLICATIONS



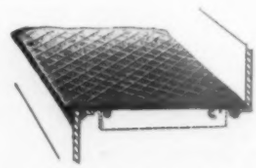
Steel Sheet Pan Stair with Wooster Safe-Groove Tread, Nosing Section No. 32.



Concrete Stair with Wooster Safe-Groove Tread, Nosing Section No. 33 and Flat Section No. 35.



Concrete Stair equipped with Type 103 Wooster Abrasive Cast Full Width Tread, cross-hatch, surface, with 3/4" Nosing.

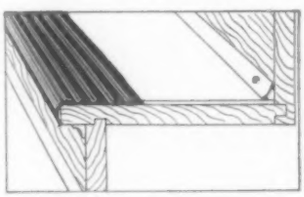


Structural Steel Stair constructed of channel stringers and steel plate risers, equipped with **Type 104 Wooster Abrasive Cast Full Width Tread**, cross-hatch surface, 1" Nosing.

Repair Stairs, Stadiums and Ramps with WOOSTER SAFETY TREADS

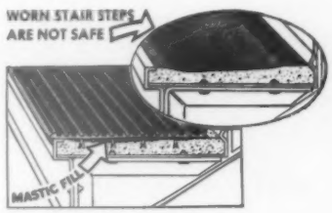
Worn, hollowed-out stair steps, stadium steps and ramps are a safety hazard, and often are the cause of painful injuries. Dangerous walkways and stairs may be easily and economically repaired; their original architectural beauty restored and indefinitely preserved with Wooster Safety Treads. No surface tread ever becomes so worn that it cannot be repaired, with Mastic Cement, to fill up the worn depression, and Wooster Safety Treads. Wooster Safe-Groove Treads with steel, yellow brass, and white alloy bases, in the various finishes available are recommended because of their easy installation for repairing stairs.

APPLICATIONS



Wood Stair with linoleum covering, repaired with Wooster Safe-Groove Tread —Steel Base Flat Section No. 34 and Nosing.

Before and after views of a concrete stair repaired with mastic cement and Wooster Safe-Groove Treads, Steel Base Nosing Section No. 36 and Flat Section No. 34.



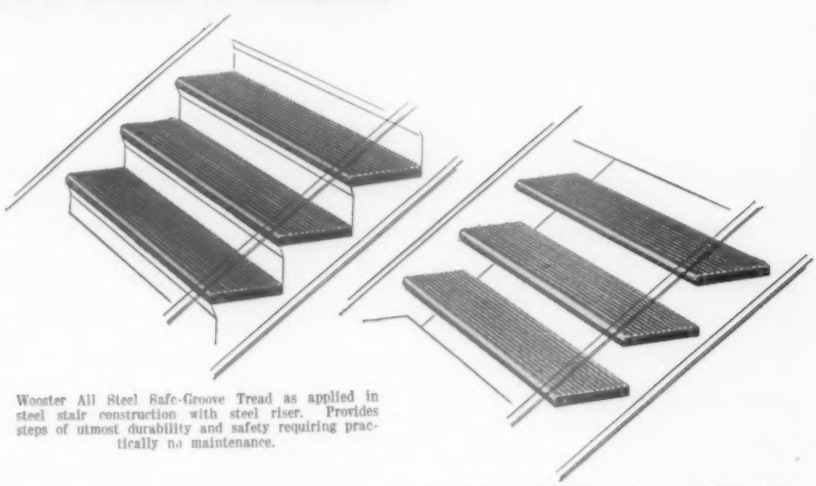
WOOSTER ALL STEEL SAFE-GROOVE TREADS

for Steel Stair Construction

Wooster All Steel Safe-Groove Treads are suitable for exterior and interior steel stair construction. They are commonly used to replace concrete filled steel pan stair construction in schools. These units provide anti-slip protection, afforded by the abrasive grit filler in the safe-groove tread, and are incomparably superior in this respect to the usual grating or checker plate type of stair step. Wooster All Steel Safe-Groove Treads can be insulated to deaden sound wherever necessary.

Use of Wooster Safe-Groove Treads eliminates the dead load of concrete commonly used in steel sheet pan stair construction and the necessity of attaching safety treads to the concrete surface, which of itself gives no anti-slip protection.

They will not clog up under grease, oil, mud, dust, etc. This feature and others have won the national acclaim of safety engineers.

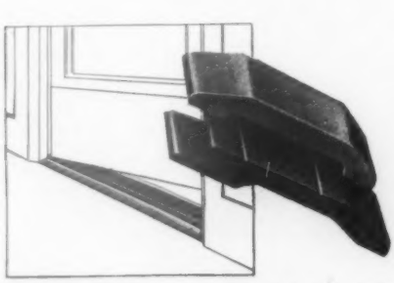


Wooster All Steel Safe-Groove Tread as applied in steel stair construction with steel riser. Provides steps of utmost durability and safety requiring practically no maintenance.

Wooster All Steel Safe-Groove Tread as applied in steel stair with open riser type construction.

WOOSTER THRESHOLDS

Wooster Thresholds meet the rigid requirements for substantial as well as economical door thresholds in both plain and weatherstripped types for all types of educational buildings. Their neat trim appearance enhances interior doorways, and they make entranceways safe, distinctive and durable. Wooster Abrasive Cast and Plain Cast Thresholds are molded of plain cast iron, bronze and aluminum; and also of abrasive cast Ferrogrit (iron), Alumogrit (aluminum), Bronzogrit (bronze) and Nicklogrit (nickel). Wooster Rolled and Extruded Metal Thresholds are formed of steel, brass and aluminum.



Consult A WOOSTER REPRESENTATIVE

The Wooster Representative in your locality possesses a background of experience and specialized knowledge of installations in educational buildings that should prove helpful to you. You may get in touch with him by referring to your local telephone or business directory, classifications "Safety Stair Treads" or "Stair Treads." Whenever unable to make proper contact with a Wooster Representative, wire or write factory at Wooster, Ohio.

Write FOR COMPLETE CATALOG OF WOOSTER PRODUCTS

THE SAFE TREAD CO., INC.

30 Vesey Steet, New York

"SAFE TREAD" ABRASIVE METAL



The responsibility for providing slipproof walkways for the safety of children and teachers has been established by the courts. Maintenance costs, also, are of utmost importance.

The use of "SAFE TREAD" for new construction or repairs will insure the highest degree of non-slip qualities and the greatest amount of wearability.

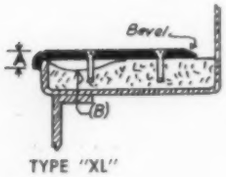
When ordering or requesting quotation, please specify kind of metal, type of nosing and surface design, length, width back of nosing, and quantity of each size desired. If unusual shapes are required, furnish detail sketch or template. If for repairs, advise type of material to be covered and any other data that will help us to function.

FOR NEW CONSTRUCTION

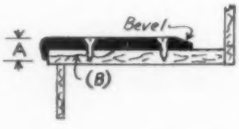
Many other forms are also available for stair treads and nosings, floor plates, trench covers, expansion joints, etc., in "SAFE TREAD" Metal.

FOR REPAIRS

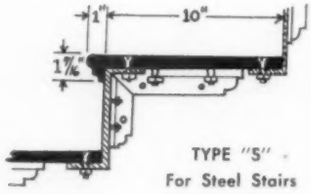
Lip 1/4, 1/2, 3/4 or 1" deep to cover worn area, with beveled back and ends, carried to within 2 1/2" of back and 3" of ends of existing treads—worn areas filled with magnesite cement — is recommended practice for repairing worn stair treads.



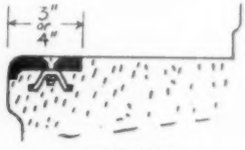
TYPE "XL"
For Steel Stairs



TYPE "L"
For Repairs

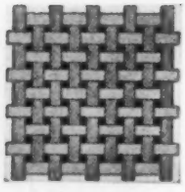


TYPE "5"
For Steel Stairs



TYPE "XL"
For New Concrete

"SAFE TREAD" CERAMIC TILE



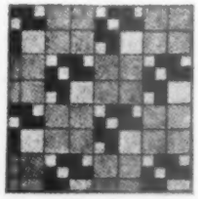
TWO-COLOR
WICKERWORK
3/4-1 9/16 series
(also 1 1/16-2 3/16)

Being vitrified ceramics with 12% abrasive content, "Safe Tread" Tile are non-porous, fast-colored, and effectively anti-slip, so are particularly desirable for washrooms and locker-rooms in school buildings.

Because of their decorative as well as anti-slip qualities, they are also especially suited for use in entrance hall floors and on all stairways.

Available in all popular colors and sizes.

Submit your walkway problems to us. We shall be glad to help you solve them



DOUBLE PLAID
3/4-1 9/16 series
(also 1 1/16-2 3/16)

THE CELOTEX CORPORATION

Chicago 3, Illinois

More and More Evidence—

ACOUSTI-CELOTEX SOUND CONDITIONING Increases School Efficiency and Comfort!



THE SUPERINTENDENT OF SOUTH CENTRAL PUBLIC SCHOOLS, SEATTLE, WASH. WRITES:

You applied type C-9 ¾ inch Acousti-Celotex to the ceilings of the corridors, and we find that the noise level has been lowered almost beyond belief. It is now possible to carry on a normal conversation in the corridors, and we can readily see that it is going to make a decided difference in the mental reactions on the part of the students and employees in this building. The classroom which you treated with the same material is much improved. The use of sound equipment such as motion picture projectors and play-back equipment function much better in this room than in any non-treated room in the building.

We are very much pleased with the work and hope that we can continue in our program of sound conditioning our school buildings until we have all rooms so treated.

Very truly yours,

J. Wesley Cummings

Superintendent

20 years of performance like this is why *more schools sound-condition with Acousti-Celotex than with any other acoustical material!*

Acousti-Celotex* gives you this double advantage in assured results: 1. *Quality control in manufacture* backed by the reputation and resources of the world-famous Celotex Corporation. 2. *Quality control in installation* backed by Celotex-selected-and-trained local distributors. The experience of more than 100,000 installations makes this the leading acoustical organization in the world.

No matter what your noise reduction problem, consult your local Acousti-Celotex distributor. No obligation. No job is too small and prompt service is assured. Or write to The Celotex Corporation, Dept. ASU-346, Chicago 3, Illinois. It will bring to your desk an expert trained in the sound conditioning of schools.

Sound Conditioning with

ACOUSTI-CELOTEX

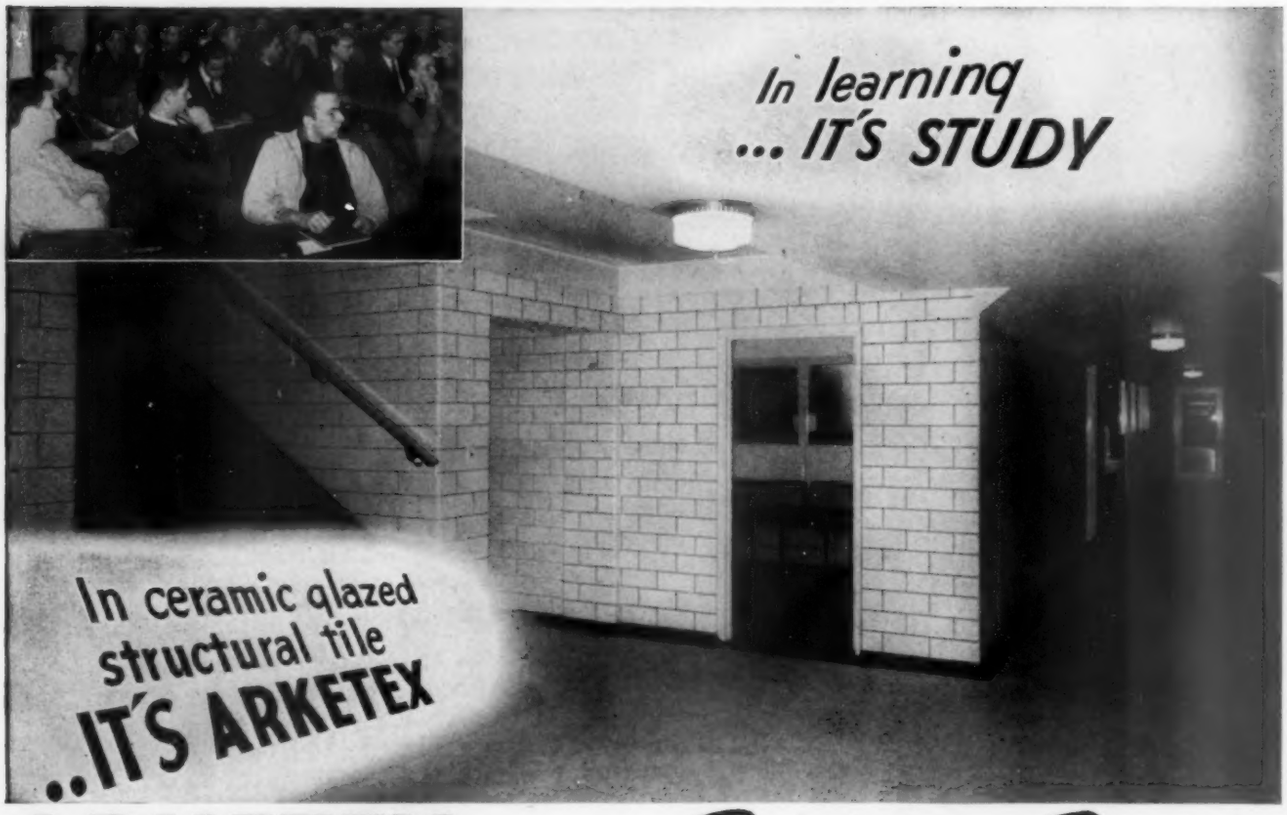
REG. U.S. PAT. OFF.

** Perforated Fibre Tile* SINCE 1925

Sold by Acousti-Celotex Distributors Everywhere • In Canada: Dominion Sound Equipments, Ltd.

ARKETEX CERAMIC CORPORATION

Brazil, Indiana



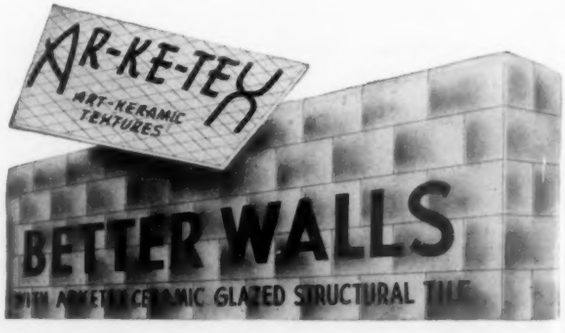
ARKETEX FOR *Budget Beauty*

Even the budget committee will like this fine tile for *the first cost is the only cost!* No periodic painting or refinishing of walls is necessary with Arketex. It is not affected by steam, water, ink, or the action of acids and alkalies which would ruin the appearance of ordinary walls. The everlasting colors are protected by a finish which won't mar, scar, crack, or craze, and which requires only soap and water washing to keep its luster. Arketex is a permanent wall and finish all in one, available in enough sizes, colors, and textures to allow the architect innumerable opportunities for variety. Be sure that buildings will maintain their orderly appearance years after construction. When planning schools, hospitals, offices or factories, specify Arketex — first with the finest in ceramic glazed structural tile.

A Peacetime Promise



Arketex' continuous achievement in the ceramic glazed structural tile field assures you the finest in workmanship. Arketex . . . the standard of textured tile.



NATIONAL FIREPROOFING CORPORATION

General Offices: Pittsburgh 12, Pa.

BRANCHES

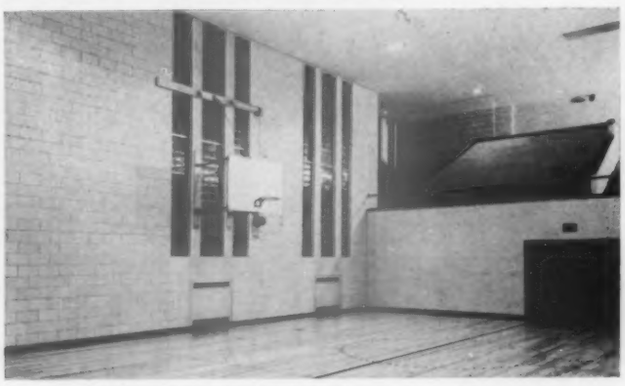
New York (17), 205-17 East 42nd Street
Chicago (6), 205 W. Wacker Drive
Philadelphia (2), 1518 Walnut Street
Detroit (8), 5737 Commonwealth Avenue
North Birmingham (7), Alabama
Syracuse (10), 225 Kensington Place
Boston (16), 20 Providence Street

IN CANADA: National Fire Proofing Company of Canada, Ltd., Toronto, Ontario

NATCO GLAZED STRUCTURAL FACING TILE
for Interior Walls, Partitions and Wainscots



Corridor, Concord Public School, Pittsburgh, Pa.

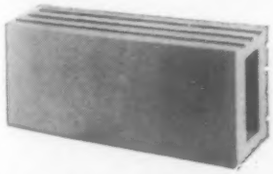


Gymnasium — High School, Wauwatosa, Wisconsin

For permanent, attractive color and architectural beauty in interior walls, partitions and wainscots in school buildings of all kind, Natco Glazed Structural Facing Tile of hard burned clay is generally regarded as standard construction. The ceramic glazes used are of the highest quality. They are high-fired, that is, burned at temperatures of approximately 2000 deg. Fahrenheit. The salt glazed are furnished in the desired mingled light buff shades.

IN NEW MODULAR SIZES

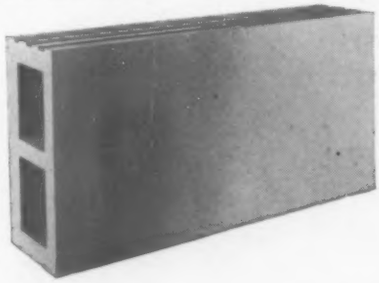
New modular sizes and design, available in 1947, adapt themselves perfectly with products of other manufacturers, with little or no cutting or fitting on the job. Actual dimensions are less than nominal dimensions by the thickness of mortar joint used.



NATCO VITRITILE
"T" Series — nominal dimensions, 5 1/3 x 12 inch face in 2, 4, 6 and 8 inch thicknesses. Ceramic, clear and salt glaze finish

Designed in 1¾", 3¾", 5¾" and 7¾" thickness to effectively co-ordinate with other building materials—single color tones or mottles—particularly desirable for walls subjected to hard usage.

NATCO VITRITILE
"W" Series — nominal dimensions, 8 x 16 inch face in 2 and 4 inch thicknesses. Ceramic glaze finish only



Smooth, impervious, glass-hard, light-reflecting interior wall surfaces of Natco Glazed Structural Facing Tile afford no lodging places for bacteria, are easily cleaned and kept clean. Such glazed tile walls provide a permanent and sanitary lining that will require no maintenance cost during the life of the school building where it is used and the initial cost is no greater than many other materials that do not have the same sanitary, structural and endurance qualities.

WHY NATCO STRUCTURAL CLAY TILE FOR FLOORS?

Fireproof, sound-resisting, unaffected by water or acids, lighter structural frame with greater design economies, floors of Natco Structural Clay Tile give level and continuous ceilings ideal for plastering and especially suited for air conditioning. We'll appreciate the opportunity to prove the efficiency and economy of Natco Clay Tile Floor Systems for school construction.

WRITE FOR INFORMATION ON ALL NATCO CLAY PRODUCTS

There is a particular type of Natco Structural Clay Tile for all types of loadbearing and non-loadbearing walls, and for all types of fire-resistive floors and roofs. Write for Natco literature.

RUSSELL R. GANNON CO.

Manufacturers of

Custom Built Heating and Ventilating Equipment to Fit the Needs of Each Individual School

Cincinnati 2, Ohio

---

20 Years of experience in research development and manufacturing stands behind the "Gannon System" of school room protection. Each unit has been designed with the idea of better student health foremost in mind. Leading school executives attest to the fact that the "Gannon System" has materially aided in maintaining high attendance figures.

GANNON UNITS

CORRIDOR
UNDER WINDOW
AUDITORIUM
GYMNASIUM

PROVIDE pure fresh air without drafts—elimination of classroom odors—substantial savings in fuel.

★



CA-5
CORRIDOR UNIT

The CA-5 Unit shown at the left is designed to do much more than merely ventilate and regulate temperature. It serves to maintain the highest health standards by *actively combatting airborne bacteria.*

TEMPERATURE EQUALIZATION



Unretouched photographs of smoke test show smooth, draftless diffusion

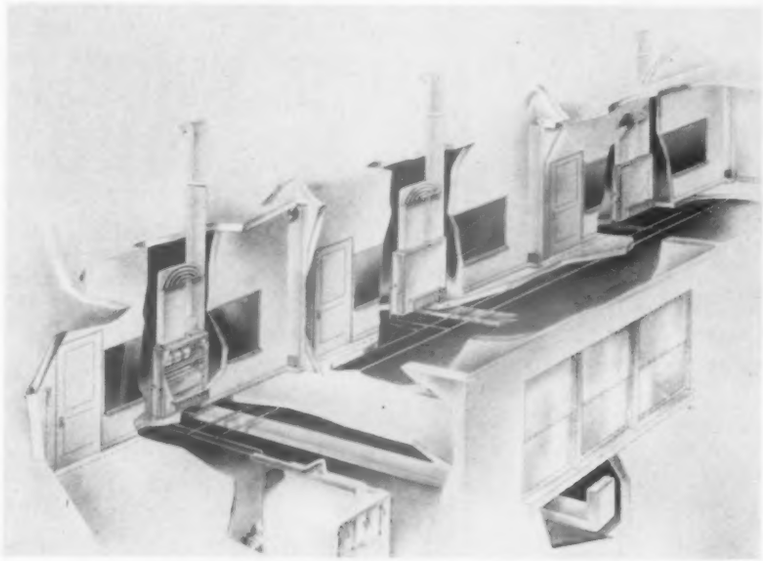
INSTALLATION

The drawing at the right shows a typical installation of Gannon CA-5 Units, illustrating the fact that no vital classroom floor space is consumed.

The unit is recessed in the corridor wall and cannot be interfered with by the students, while access to the unit itself is easily and quickly gained by the janitor or engineer, from the corridor side.

Each room is serviced by a single unit with individual thermostatic control.

Signal lights on each unit indicate to the janitor or engineer the exact air conditions in each room without the necessity of opening the classroom doors and disturbing the classes.



Typical installation of CA-5 corridor units



CA-5 installations from corridor side

LOW COST OF OPERATION

Yearly operating costs show that CA-5 Units provide great savings in fuel over ordinary systems.

Insurance rates have likewise been lowered with the installation of these units.

★

Our engineers are available for consultation with architects and consulting engineers in the selection of equipment and preparation of layouts for both remodeling and new construction. Complete information on request without obligation.





GANNON UNITS ARE IDEAL IN BOTH NEW CONSTRUCTION AND REMODELING

CANTON STOKER CORPORATION

731 Andrew Place, S. W., Canton, Ohio

SPECIFIED FOR SERVICE

WHERE DEPENDABILITY AND ECONOMY COME FIRST!

CANTON STOKERS SAVE FUEL, MANPOWER, MONEY

One out of every four CANTON orders received during the past 15 years has been a repeat order.

Canton equipment is operating in 31 states, the District of Columbia and Canada—indicating its adaptabilities to a wide variety of applications and employing its sound and correctly engineered features.



CENTRAL CATHOLIC HIGH SCHOOL FT. WAYNE INDIANA

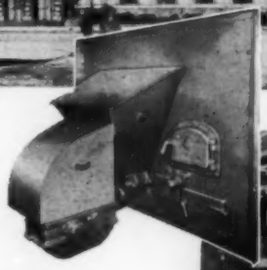


Two Vulcan Ramfeed Side-Dump Canton Stokers meet every requirement for heat and power economically for the modern Central Catholic High School.



CANTON STOKERS

TIMKEN VOCATIONAL HIGH SCHOOL CANTON, OHIO



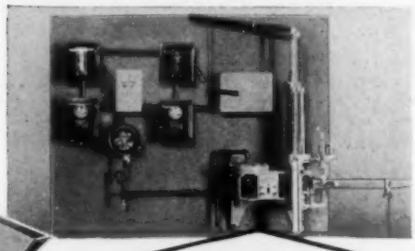
At Timken Vocational, three Lo-Set Ramfeed Side-Dump Canton Stokers are installed under Locomotive Steel Firebox Boilers. Note hopper extensions for overhead loading.

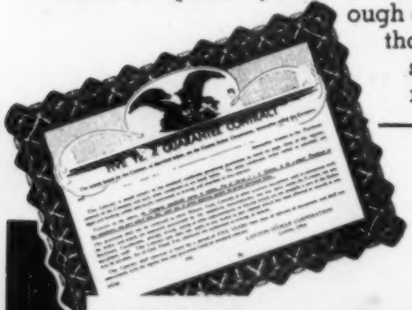


INSTALLATION AT TIMKEN VOCATIONAL

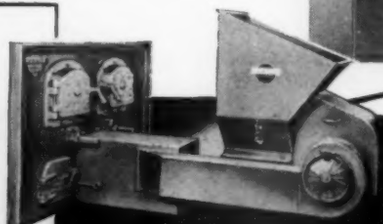
54 TYPES and SIZES for EVERY NEED UP TO 800 H. P.

Rugged construction meets severe service demands. Firing efficiency saves many dollars in fuel and manpower. Canton Stokers are literally engineered for each specific job. You can be certain after thorough analysis of your need, that the Canton model selected will meet all requirements.





THE ONLY STOKER **GUARANTEED** FIVE YEARS AGAINST DEFECTS AND WEAR!



CANTON DURAFLEX WORMFEED

A side dump stoker — front fan mounting—zoned air control—especially adaptable to converting existing boilers to stoker firing.

SYNCHRONIZED COMBUSTION CONTROL PANEL

Compact, attractive arrangement of Safety Switches, Magnetic Starters, Banking Switch, Pressure Limit Control, Coal Feed Timer and Master Regulator. Positively keeps in balance the Coal feed, the Forced Air and Stack Draft . . . maintains highest efficiencies.

Write today for descriptive LITERATURE AND COST SAVING FACTS

LINK-BELT COMPANY

STOKER DIVISION

2410 West 18th Street, Chicago 8, Illinois

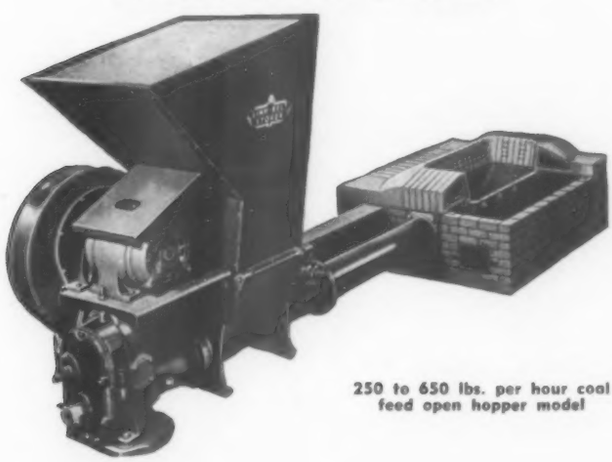
10270

EQUIPMENT FOR CUTTING FUEL COSTS: Heating plant modernization that pays for itself through higher combustion efficiency and lower fuel cost is provided by Link-Belt automatic coal firing. And, you have other important advantages such as smokeless operation, automatic pressure or temperature control, attendant relieved for other duties, higher boiler capacity and quicker steam generation.

The Link-Belt Stokers illustrated below show the complete line, from domestic (home) sizes for bituminous or anthracite, to commercial and industrial sizes up to 300 BHP (1200 lbs. coal feed per hour).

Designed, built and backed by Link-Belt—an engineering and manufacturing organization since 1875. Boiler room coal handling equipment also available. Write for literature; mention size of heating plant.

POWER-FLEX COAL STOKERS



250 to 650 lbs. per hour coal feed open hopper model



150 and 200 lbs. per hour coal feed closed hopper model



1000 and 1200 lbs. per hour coal feed, open hopper model with separate fan

"CHALLENGER" MODEL STOKERS

Bituminous Hopper Model 30 and 50 lbs. per hour coal feed





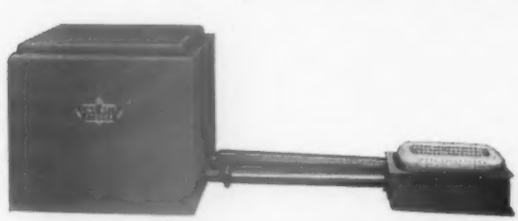
Bin-Fed Bituminous 30 and 50 lbs. per hour feed

Anthracite Hopper Model 25 to 75 lbs. per hour coal feed





Anthracite Bin-Fed unit 25 to 50 lbs. per hour coal feed with ash removal added



Bituminous Hopper Model 75 and 100 lbs. per hour coal feed shown above

PETROLEUM HEAT & POWER COMPANY

Main Office and Factory: Stamford, Conn.

Oil Burning Equipment—*"Since 1903"*—Fuel Oils

PETRO
REG. U.S. PAT. OFF

OIL BURNING SYSTEMS

"Cut Steam Costs for Schools and Universities"

Automatic boiler operation is the aim of cost-conscious management, but for various sound reasons, it may not be feasible in certain plants. Consequently, Petro burners are available for three general methods of operation:

AUTOMATIC—SEMI-AUTOMATIC—MANUAL

Petro's operating economies, proved every month in thousands of installations, are due to principles rather than "features" or gadgets. Experience-developed design for specific application, inherent simplicity, and traditionally fine manufacture are basic in Petro burners.

In automatic operation these are enhanced by two important factors in firing efficiency and fuel economy. These are:

(1) PETRO'S THERMAL-VISCOSITY CONTROL

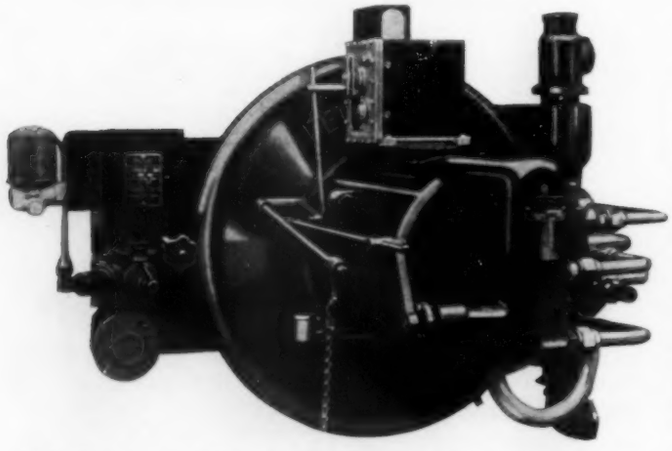
—a well proven system for burning No. 6 or Bunker "C" oil at maximum combustion efficiency under absolute control without any need for frequent manual adjustment—the only method of burning preheated oils which can be called "automatic" legitimately.

(2) MODULATED FUEL CONTROL

—a completely automatic control of high-low operation which permits automatic low fire starting and modulation or acceleration of firing to meet fluctuating steam demands:—maximum combustion efficiency at every stage of firing. Illustration shows modulating motor as mounted on burner (when specified) and arms and linkage through which constant fire-regulation is maintained.

SPECIFYING ENGINEERS will find it helpful to have complete information on these factors which so markedly affect operating costs. Petro Industrial Burner Catalogue may be found in "Sweets," and in "Domestic Engineering" Catalog Files, or copy will be sent gladly on request.

MODEL W-DIRECT DRIVEN, ROTARY CUP TYPE BURNERS



This Burner is a self-contained assembly of motor, fan, pump, rotary cup atomizer and all air and oil adjustment apparatus. Illustrated above is a Petro Model W for Automatic operation on No. 6 (Bunker "C") fuel oil.

Interlocking air and oil control mechanism permits any minimum or maximum operation required within the burner's range of operation. Counter-flow Angular Air Vanes at nozzle increase air and oil turbulence and aid efficient combustion of heavy fuel oils.

Special oil adjustment valve meters oil to rotary cup, yet permits manual operation without disturbing permanent burner adjustment.

CAPACITIES

Model	Motor H.P.	Max. Gals. Per Hour	Rated Capacity Boiler H.P.	Sq. Ft. C. I. Steam Radiation *
W-2½	⅓	11	34	4,800
W-3	½	15	47	6,540
W-4	½	25	78	10,825
W-5	1	33	103	14,300
W-6	2	45	141	19,600
W-7	2	62	195	27,150
W-8	3	100	313	43,500
W-9	3	145	454	68,000

W-2½ to W-9 burns No. 5 fuel oil of 300 seconds maximum viscosity at 100° F. Saybolt Universal or any lighter oils without preheating. When heavier No. 5 or No. 6 (Bunker C) fuel oil is used, preheating is required. Models W-2½, 3 and 4 burners, single phase 110 or 220 volt, 50 or 60 cycle. Model W-5 single phase, 220 volt, 50 or 60 cycle.

All models, 220, 440, 550 volt, polyphase, 50 or 60 cycle.

W-2½ to W-8 belt driven type is available in 25, 30, and 40 cycle A.C. for all standard voltages, single or polyphase; also 115-230 volt D.C.

(*) Equivalent Direct Cast Iron Steam Radiation measured at the boiler outlet.

Removable rotary cup and nozzle permits changing shape of flame to suit requirements of any boiler and prevent flame impingement.

Oil pump is a slow speed, permanently packed, self-priming, self-aligning, non-binding or clogging mechanism, assembled as an integral part of burner. Burners also available without integral pump. Motor is cooled by induced circulation of air. Armature shaft is mounted on two deep-groove annular ball bearings. Splash lubrication from the sump which is below the pump drive, lubricates all bearing surfaces in the burner.

FOR SMALL SCHOOLS — or other structures requiring up to 6300 sq. ft. E.D.R. or equivalent, Petro "Domestic type" automatic burners for light (No. 3) fuel oils are widely used. This line includes conversion burners to oil-fire existing boilers, and complete "Units" for heating and for separate hot water supply. Domestic Catalog on request.

ADVANTAGES PETRO PROVIDES

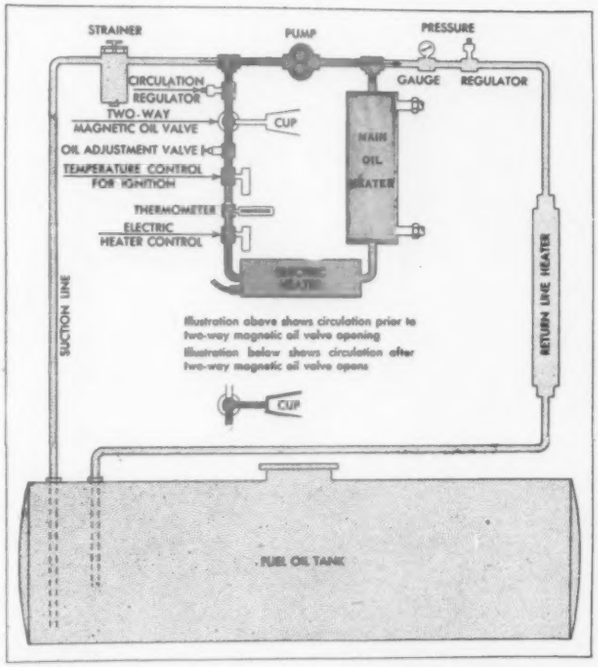
AUTOMATIC OPERATION is an outstanding advantage of Petro's W-AH burners and systems for burning preheated oils at maximum combustion efficiency. Petro was the first to build and obtain Underwriters' approval for automatic operation on No. 6 oil. The whole Petro System is automatic —not just parts of it. The modulating control described in detail in Petro Catalog makes an important contribution. The Thermal Viscosity control is even more important.

The operation of Thermal Viscosity Control may be seen from the schematic sketch at right and the description below it. The basic principle is accurate control at the source of heat applied to the oil. No other method for burning No. 6 oil may be called "automatic" legitimately.

MECHANICAL OPERATION required for correct use of preheated oil is provided in Petro W-AH burners with the absolute minimum of moving parts. Possibilities of need for manual attention are thus greatly reduced, and experience shows the cost of upkeep to be negligible.

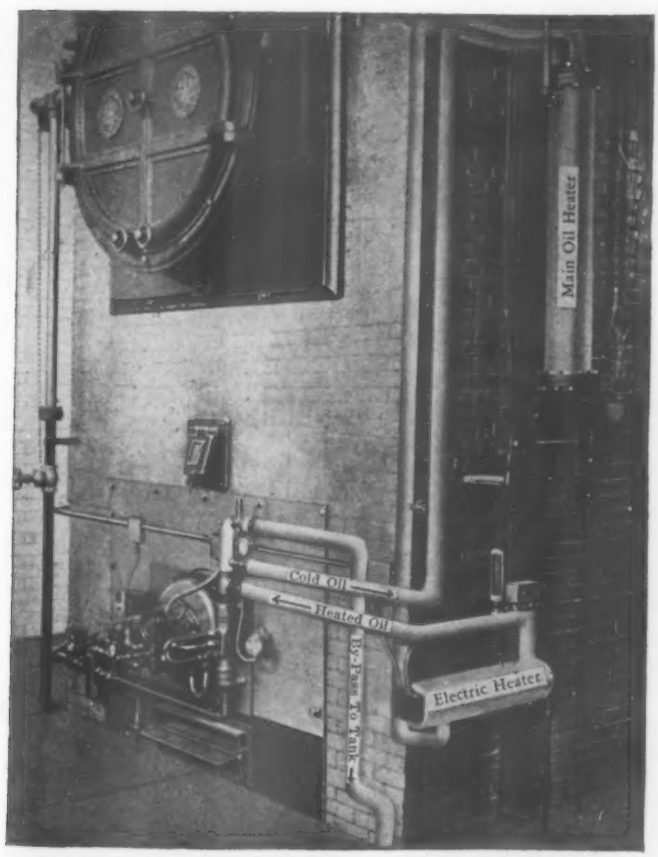
Engineering and installation instruction for each installation, based on the requirements of each specific application, are supplied by Petro. These burners are not stock items, but are manufactured and shipped within 48 hours (under normal conditions) for the installation for which they are ordered.

All rotating parts are carefully balanced to eliminate vibration and thus insure long operating life. Every material is held to close specifications on inherent qualities necessary to maximum service.



Oil from tank is drawn through suction line and strainer by pump on burner; thence into "oil circuit" (heavily shaded) and is pumped around this circuit, by-passing the atomizing cup, until thermostatically controlled electric heater has raised oil to the predetermined ignition temperature. Only when this temperature is reached will the magnetic oil valve pass oil to the cup, and the electric heater cuts out automatically as soon as the boiler temperature permits the main oil heater to maintain necessary burning temperature. (See adjacent photo of typical installation.)

Oil in excess of load requirements is by-passed around main oil heater back to storage. This simple Petro Thermal Viscosity System eliminates all need for mechanical "extras" which attempt control of rate of flow of No. 6 oil to atomizing cup—no frequent manual adjustments are required on Petro.



SERVICE is available for this equipment through the Branches of the Petroleum Heat and Power Company or the offices of distributors located throughout the country and in many foreign countries. Replacement parts are also available from a large and complete stock maintained by the manufacturer at the Stamford, Conn. Factory, which is open day and night, every day throughout the year.

ENGINEERING CONSULTATION

The savings which commonly result from proper installation of commercial or industrial oil burner equipment fully justify the relatively small difference in cost between an ordinary oil burner installation and the best equipment, installation and engineering practice available. Efficient and economical operation absolutely require correct basic layout, adequate pipe sizes, and experience-proved materials; but this slight added cost is returned many-fold.

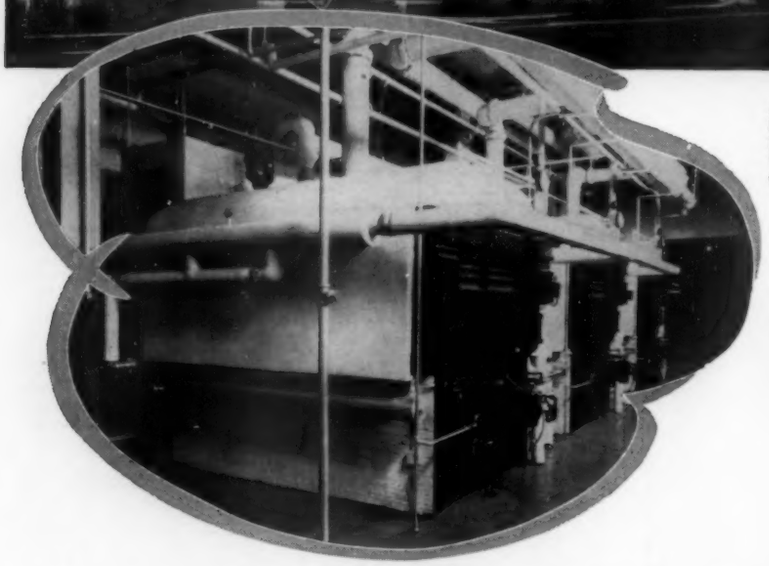
The Petroleum Heat and Power Company welcomes consultation about all phases of contemplated or existing oil burning systems. Over 40 years' experience is available on which to base a recommendation for full automatic, semi-automatic, or manual operation with light or heated heavy oil.

THE H. B. SMITH COMPANY, INC.

Westfield, Mass.

BRANCH OFFICES AND SALES REPRESENTATIVES IN PRINCIPAL CITIES





Junior and Senior High School, Harrison, N. Y. Architect, Robert Vignola, Harrison, N. Y.; Consulting Engineers, Daniel & Wallen, New York City; Heating Contractor, John Winkel Co., Inc., Larchmont, N. Y. Boiler Plant consists of three 20-section 260 Smith Cast Iron Header Type Boilers.

Boiler Plant...

for the POST WAR SCHOOL

City school operating officials are obviously in a favorable position to compare fuel and maintenance costs of various types of heating systems. Basing their findings on long term studies of these operating expenses it is significant that more and more school departments regularly specify H. B. SMITH boilers as standard equipment for their buildings.

Architects and Engineers who are now confronted with the specification of heating systems for public schools to be built post war would do well to study installations in like projects erected immediately pre-war to find the answers to many of their questions.

It is our prediction that as far as actual heat generation is concerned, the boiler plant of the 194? school will closely resemble the best installations of 1941. Recently built schools such as Westchester's Harrison High have set the standard for post war school heating.

H. B. SMITH cast-iron boilers installed in hundreds of recently built schools have not only been capable of that flexibility of performance needed by modern heating and air conditioning systems, but have proven themselves adaptable to the use of different fuels and methods of firing forced by the events of the last three years. Despite reductions in the amount of fuel available these SMITH boilers have operated with characteristic economy, reflecting credit on both their specifiers and installers.

It is this proven performance that makes an H. B. SMITH specification the best bet for today's planners of tomorrow's schools.

Complete engineering data and specifications of H. B. SMITH Boilers are filed in the Domestic Engineering Directory and Sweet's "Architectural."

H.B. *Smith*

CAST-IRON BOILERS

JOHNSON SERVICE COMPANY

Milwaukee 2, Wisconsin

BRANCHES IN ALL PRINCIPAL CITIES

TEMPERATURE CONTROL EQUIPMENT

by **JOHNSON**

for MODERN SCHOOLS *and College Buildings*



THERE are three general methods of heating and ventilating modern school buildings. In order that all the elements which enter into these systems may be correlated properly and function in correct sequence, it is essential that a complete, unified system of automatic temperature control be installed, as developed by Johnson. No unrelated collection of devices sold "over the counter" and installed by mechanics not familiar with the type of work, will give satisfaction.

1. THE COMBINATION OR "SPLIT" SYSTEM

Heating consists of direct radiators, generally of sufficient size to offset the heat loss from the exposed wall and glass surface. Ventilation requirements are met by indirect radiation of sufficient capacity to warm the air, which is delivered by the duct system.

2. "UNIT" SYSTEM

Direct radiators partially offset the heat loss from the exposed wall and glass surface, and an indirect radiator in the unit ventilating machine furnishes the additional heat necessary and provides for ventilation requirements.

3. BLAST OR "INDIRECT" SYSTEM

A mixture of outdoor and return air is drawn into the combined heating and ventilating system and then forced through automatically controlled heating coils or tempered air by-pass into warm and tempered air chambers. Double Mixing Dampers in the individual duct to each room are controlled by a room thermostat, insuring the proper temperature for each space.

All of the requirements for automatic control of these systems have been carefully worked out by Johnson. Write for booklet with detailed descriptions and illustrations of the three methods of heating and ventilation in modern schools.

THE MERCOID CORPORATION

4207 W. Belmont Avenue Chicago, Illinois



MERCOID

The Only 100% Mercury Switch Equipped Controls

FOR HEATING, AIR CONDITIONING, REFRIGERATION AND VARIOUS INDUSTRIAL APPLICATIONS

There is scarcely an industry that is not using a Mercoid Control somewhere on vital applications in the control of temperature, pressure, liquid level, mechanical operations, etc. ★ The reason is based on their record for dependable operation and long service. They are easy to install, adjust and require practically no attention ★ The hermetically sealed mercury switches used in all Mercoid Controls are dust, dirt and corrosion-proof, thus assuring positive performance under all operating conditions. These mercury switches are also available to the trade in various types for different applications ★ If you have a switch or control problem, let Mercoid engineers give you the benefit of their wide experience.

Below are a few items briefly described. See catalog No. 600 for the complete line and further information. A copy will be sent upon request.



THERMOSTATS

Various types available for both low and high voltage applications. All types excepting the line voltage type are known as Mercoid Sensatherms, including the regular, Day and Night, Two Stage and dual. All Mercoid thermostats are noted for their close air temperature control.



VISAFLAME CONTROL SYSTEM

(Actuated by Light)

For domestic and industrial oil burners. It operates direct from the light of the flame. Among its many desirable features is the fact that it may be built within the burner unit—a step ahead in oil burner controls.



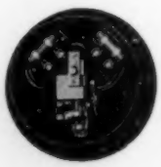
REMOTE STEM TEMPERATURE CONTROLS

For control of liquids or gases, such as air, oil, water, paraffin, glue or distillate vapors and many other industrial applications. The control is equipped with convenient outside double adjustments.



EXPLOSION-PROOF CONTROL CASES

For use with various Mercoid Controls to be installed in hazardous locations, such as oil refineries, ammunition plants, flour mills, or where dust or vapors form an explosive mixture with air.



DIAPHRAGM CONTROLS

For low pressures where regulation is required in inches of water, either pressure or vacuum. They are used to regulate gas pressures, as safety or signalling devices; also with air circulating fans on recirculating ovens, etc.



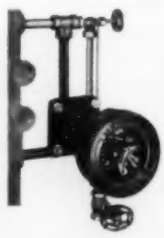
LEVER ARM AND FLOAT CONTROLS

These controls have a variety of applications where it is desired to mechanically open and close electric circuits. Mercoid float controls are used for maintaining fluid levels in tanks or for control of sump pumps or cellar drainers. The counterbalanced type is used on tanks where there is a surge in liquid. The plunger type is used on closed tanks.



PRESSURE CONTROLS

For numerous industrial applications. The outside double adjustments eliminate guesswork when setting controls. Indicators show the operating range on the calibrated dial. Available in many pressure ranges for direct or remote connections.



COMBINATION PRESSURE AND LOW WATER CONTROL

For the protection of automatically fired steam boilers to prevent the hazard of firing into dry boilers, also guards against building up excess steam pressure. Equipped with quick hook-up fittings. Various other types of low water controls available.



TRANSFORMER-RELAYS

Type V is a reliable low voltage mercury contact relay which also acts as a transformer inducing low voltage (24 volts) on the pilot circuit. There is no hum or chatter. Used for all types of automatic equipment. Available in various voltages, cycles and circuits.

JOHN J. NESBITT, INC.

Manufacturers of

Heating, Ventilating and Air Conditioning Equipment

State Road and Rhawn Street Philadelphia 36, Pa.

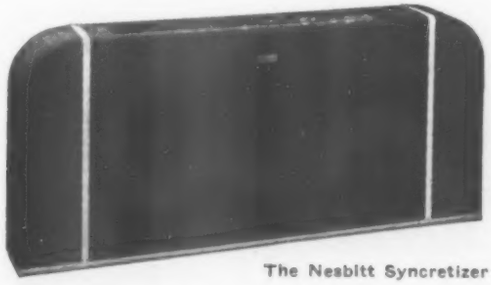
Today's Most Healthful Heating and Ventilating for New or Remodeled School Buildings



The Nesbitt "Package"

NESBITTS now make all the units in this modern classroom ensemble: Nesbitt Syncretizer Unit Ventilators and Nesbitt Convectors designed for combination with Nesbitt Classroom Shelving — a "complete package." The shelving units are made of durable steel in various widths for installations in any size classroom.

RESULT of years of scientific research and progress, the Nesbitt Syncretizer represents the most advanced thought on heating and ventilating the schoolroom. It brings in and distributes to the classroom a continuous supply of fresh, outdoor air, and "syncretizes" (or harmonizes) it with room air so as to maintain a healthful, comfortable June-like condition, even when the outside temperature is below zero.



The Nesbitt Syncretizer

BEAUTY AND PERFORMANCE

The Syncretizer's simple beauty conforms to schoolroom needs. Tests have proved it the quietest of units because of the exclusive Nesbitt combination of four silent-type fans, perfectly balanced on a "floating" shaft, rotated by the quietest motor obtainable, the whole action hushed by an insulated casing. Its economy of fuel and current wins lasting favor. In competitive demonstrations before school boards, the Nesbitt Syncretizer has outsold all other unit ventilators.

DRAFTLESS FRESH AIR WITHOUT OVERHEATING

The Nesbitt Syncretizer prevents drafts, overheating, unpleasant odors. It is adjustable according to any State's laws to deliver all or part outdoor air, but always some outdoor air to occupied classrooms. Its special Air-Stream Minimum Temperature Control provides that all outdoor air is first warmed to a safe minimum temperature to prevent drafts. Room Temperature Control assures that the desired room temperature will be uniformly maintained without overheating.



SERIES B THERMOVENTS

For heating and ventilating auditoriums, gymnasiums, assembly halls, etc. See Publication 227-2.

ARMY E NAVY

NESBITT *Syncretized Air*

Nesbitt Syncretizers are so'd by American Blower Corporation and John J. Nesbitt, Inc. Complete information is contained in Publication 231-2. For engineering data, Publication 225-2.

WARREN WEBSTER & COMPANY

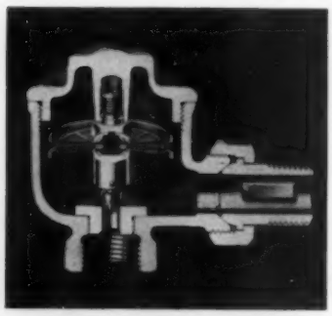
Pioneers of the Vacuum System of Steam Heating . . . Est. 1888

Department A. U.—46 Camden, New Jersey

REPRESENTATIVES IN PRINCIPAL CITIES . . . Consult Telephone Directory

In Canada: Darling Bros., Ltd., Montreal, Quebec

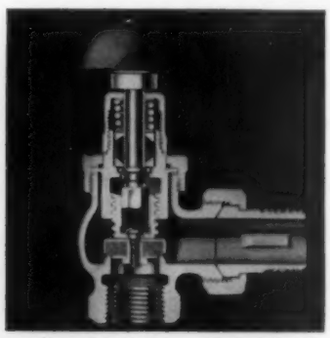
WEBSTER SYSTEMS OF STEAM HEATING, standard in the finest schools and universities, supply heat *when* you want it—*where* you want it. In thousands of schools, from Maine to California, performance records have proved that Webster Systems are highly efficient in any climate requiring heat.



Webster Series "7" Thermostatic Radiator Traps

THE WEBSTER MODERATOR SYSTEM OF STEAM HEATING has just four control elements. (1) An Outdoor Thermostat prevents costly overheating by automatically changing heating rate when outdoor temperature changes. (2) A Variator provides hand control when you want it. (3) A Pressure Control Cabinet assures correct pressure difference in the system. (4) A Motorized Steam Valve admits just the right amount of steam. The steam admitted to the system by these four elements is proportionately distributed to each radiator by Webster Metering Orifices.

WEBSTER SERIES "7" THERMOSTATIC RADIATOR TRAPS hold steam in radiators until it has given up all its heat. Insures against any waste of "live" steam. . . . Available in three sizes—200 sq. ft., 400 sq. ft., and 700 sq. ft. Also in several body models. Employing time-tested Webster thermostatic element, a diaphragm of phosphor bronze fully compensated for pressure.

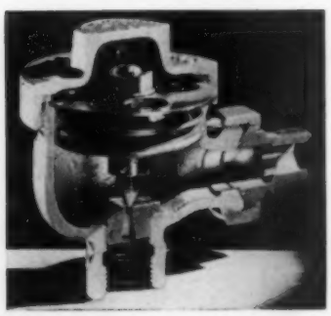


Webster Radiator Supply Valves

WEBSTER RADIATOR SUPPLY VALVES open easily in less than a turn of the handle. Construction is a proven Webster design, fully meeting "spring packless" specifications—a heavy spring pressing on die-molded metallic ring packing. Non-rising stem. Available in five sizes—½", ¾", 1", 1¼" and 1½"—angle body with wheel handle. Also offset and straight-way models in ½", ¾", and 1" sizes.

WEBSTER FLOAT AND THERMOSTATIC TRAPS made for pressure and capacity conditions encountered at all drip points. Continuous draining assured by float-controlled outward opening valve. Full-sized thermostatic bypass insures continuous discharge of all air and non-condensible gases.

WEBSTER DIRT STRAINERS are placed in return lines of the heating system ahead of traps to protect them from pipe scale, dirt and sediment. Basket easily removed for cleaning.



Webster Series "78" Process Steam Traps

WEBSTER SERIES "78" PROCESS STEAM TRAPS insure top-notch results in operation of sterilizers, laundry and kitchen equipment. Built of finest materials, selected for ability to withstand the severe service involved in handling steam at high pressures. . . . Available in five sizes—⅜" No. 780, ½" No. 781, ½" No. 782, ¾" No. 783, and 1" No. 784. Class 2 for pressures of 15 to 60 lbs. Class 3 for pressures of 60 to 150 lbs. Fully compensated for pressure throughout operating range.

WEBSTER PRODUCTS AND SERVICES include: Process Steam Traps, Radiator Valves, Thermostatic Traps, Dirt Pockets, Dirt Strainers, Lift Fittings, Expansion Joints, Steam and Oil Separators, Vacuum Governors, Webster-Nesbitt Unit Heaters, Boiler Protectors, Boiler Return Traps, Vent Traps, Vacuum and Vapor Systems of Steam Heating, Central Heat Controls, Heating Modernization Program, Webster Baseboard Heating, Industrial Heating Surfaces and Concealed Convector Radiators.

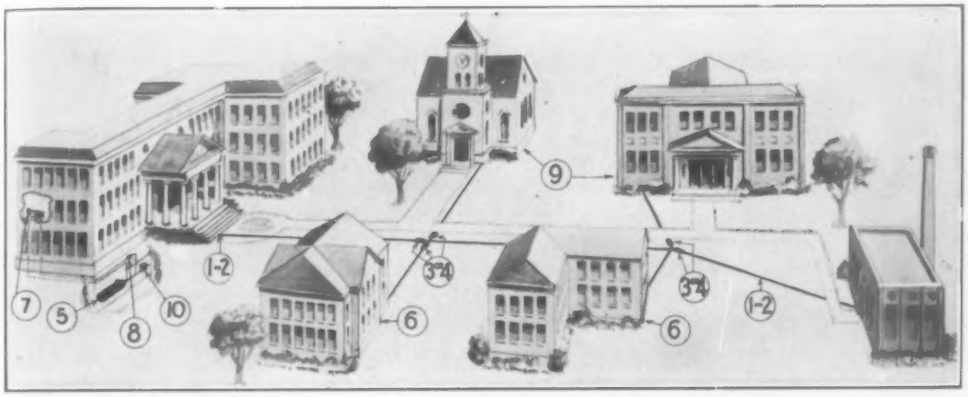
AMERICAN DISTRICT STEAM COMPANY

IN BUSINESS OVER SIXTY YEARS

Manufacturers of District Steam Heating Equipment and ADSCO Water Heaters

North Tonawanda, N. Y.

BRANCHES AND AGENTS IN PRINCIPAL CITIES



1. ADSCO-Bannon Tile Conduit
2. ADSCO Fiberglas Insulation
3. ADSCO Slip Type Expansion Joint
4. ADSCO Packless Expansion Joint
5. Storage Type Water Heater
6. Instantaneous Water Heater
7. Radiator Valves
8. Vertical Steam Trap
9. Reducing Valves
10. Rotary Condensation Meter

DISTRICT OR CENTRAL HEATING FROM A SINGLE BOILER PLANT GIVES HEATING COMFORT, FUEL ECONOMY AND CLEANLINESS

Practically all large universities and many small colleges comprising a group of buildings are heated by a district or central heating system from a single boiler plant through underground lines to various buildings. As each new building is erected, a heating line connects it to the heat distribution system.

The advantages of a district or central heating system apply to the small as well as to the large college. The boiler plant can be located at a distance from the main buildings and operate with maximum fuel efficiency without the fire hazard, soot, ash and janitorial problems confronting colleges with individual boilers in each building. All basement space can be devoted to college activities instead of partially to boilers, coal bins and ash receptacles.

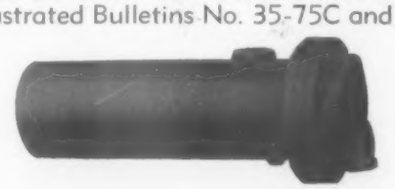
We manufacture all of the equipment necessary for the complete installation of a district or central heating system and we welcome the opportunity of cooperating with architects, mechanical engineers, college superintendents of buildings and business managers so that we can make recommendations on campus heating distribution systems. A copy of the ADSCO Catalog No. 35 describing our products is available upon request.

ADSCO Storage and Instantaneous Heaters



Plenty of hot water is essential to the modern college and ADSCO can supply storage or instantaneous water heaters designed to meet your exact requirements for domestic hot water in dormitories, laundry and kitchen use, for showers or swimming pool water heating or special water heating or cooling needs.

ADSCO Heaters are simple in design, expertly engineered and fabricated to order in accordance with the latest mechanical standards. Write us of your water heating problem for recommendations and prices on economical ADSCO Heaters or request illustrated Bulletins No. 35-75C and 35-76A.



ADSCO Rotary Condensation Meter



One of these meters in the basement of each college building will tell you the pounds of steam used for heating; enable you to detect heat losses and allocate heating costs. Available in sizes from 250-12,000 lbs. per hour capacity; counter reads directly in pounds, easily installed and cleaned. Write for Bulletin No. 35-80A.

ADSCO Vertical Steam Trap



A compact, dependable float type steam trap with reversible valve and seat, with or without thermostatic air by-pass for vacuum or gravity service. Easily installed to drip steam lines, water heaters, unit heaters or other equipment. Easily maintained—all mechanism mounted on the cover for quick removal without disturbing piping connections. Write for Bulletin No. 35-86.

ADSCO Slip or Packless Expansion Joints

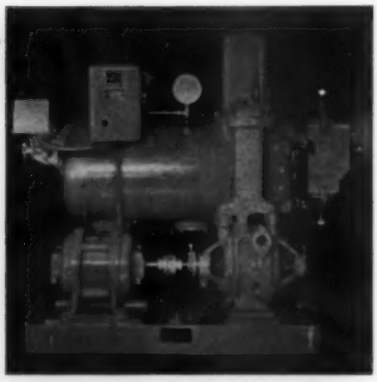


ADSCO offers several types of expansion joints including slip and packless joints for district or central heating systems as well as tile conduit for underground pipe lines, alignment guides, saddle plates, pipe supports, etc., which are illustrated and described in the latest ADSCO Catalog No. 35.

THE NASH ENGINEERING COMPANY

222 Wilson Road — South Norwalk, Conn., U. S. A.

SALES AND SERVICE OFFICES IN ALL PRINCIPAL CITIES



JENNINGS RETURN LINE VACUUM HEATING PUMPS

Standard with the heating industry for over sixteen years. Jennings Pumps remove air and condensation from the return lines of vacuum steam heating systems, discharging the air to atmosphere and returning the water to the boiler.

Two independent pumping units are combined in a single casing—an air unit which handles only air, and a water unit which handles only water. The capacity of each unit is simultaneous capacity. Each handles the full rated capacity independent of the other. Impellers of both are mounted on the same shaft. The pump is bronze fitted throughout.

Supplied either direct connected to standard electric motors, for belt drive, or for steam turbine drive. For continuous or automatic operation against pressures up to 40 lbs. Supplied standard in capacities up to 300,000 sq. ft. E.D.R. Bulletins on request.



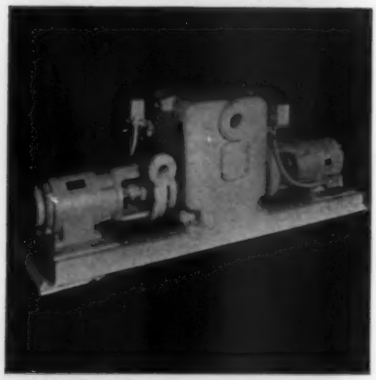
JENNINGS VAPOR TURBINE VACUUM HEATING PUMPS

The Jennings Vapor Turbine Heating Pump combines all of the advantages of the Standard Jennings Return Line Heating Pumps with a new type of drive, a specially designed low pressure turbine which operates directly on steam from the heating mains on any system, requiring a differential of only 5 in. of mercury, and returns that steam to the heating system with practically no heat loss.

This pump affords the economy which goes with a continuous condensation return and steady vacuum, and at no cost for electric current.

The Jennings Vapor Turbine is a safe heating pump, for it functions as long as there is steam in the system, entirely independent of electric current failure. Ideal for Greenhouse, School, and Hospital service.

Furnished standard in capacities up to 150,000 sq. ft. E.D.R. Bulletin on request.



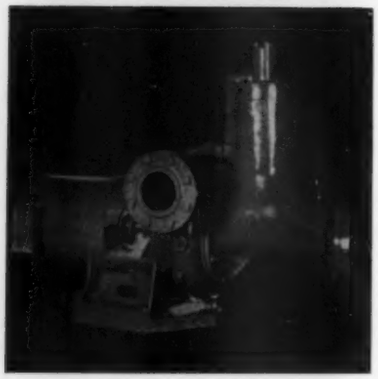
JENNINGS CONDENSATION PUMPS

Jennings Condensation Pumps remove condensation from radiators in return line steam heating systems and pump condensation back to the boiler.

Jennings Condensation Pumps are sturdy and compact in construction, and combine receiving tank, pump and driving motor in a single assembly. Bronze fitted throughout, with Tobin bronze shaft. Impeller is of special design adapted to handling hot water with highest efficiency.

They efficiently remove condensation from radiators, particularly those set below the boiler water line level. Pump casing forms part of return tank, making a compact structure that conserves floor space. Rectangular construction permits installation in corner or against wall.

Jennings Condensation Pumps are furnished in standard sizes with capacities ranging from 1½ to 225 g.p.m. of water, for serving from 1,000 to 150,000 sq. ft. equivalent direct radiation. Bulletin on request.



JENNINGS SUMP AND SEWAGE PUMPS

The Jennings Suction Sump Pump is a self-priming centrifugal pump for handling seepage water and liquids reasonably free from solids. The Suction Sewage Pump is fitted with a non-clog type impeller. Pumps are mounted entirely above the sump where they are always readily accessible. Only the suction pipe is submerged.

There are two moving parts: the centrifugal impeller and the vacuum priming pump rotor. Both rotate without metal-to-metal contact in the casing. Both are mounted on the same shaft that carries the rotor of the electric driving motor, making a compact assembly.

These pumps may be installed away from the pit, or directly over the pit. The Pedestal Type Jennings sets directly on the pit cover, requiring no other foundation.

Capacities and heads to meet all requirements. Bulletins on request.

THE RIC-WIL COMPANY

INSULATED PIPE CONDUIT SYSTEMS

Union Commerce Bldg., Cleveland, Ohio FACTORY: Barberton, Ohio

OFFICES IN PRINCIPAL CITIES

RIC-WIL offers Conduit for every need—

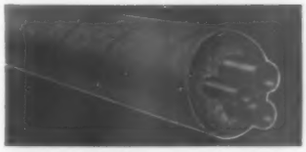
THE MOST COMPLETE LINE—MEETING ALL CONDITIONS OF SERVICE AND COST

THERE IS A RIC-WIL INSULATED CONDUIT SYSTEM ENGINEERED TO THE SPECIFIC NEEDS OF SCHOOLS, UNIVERSITIES AND OTHER INSTITUTIONS FOR THE DISTRIBUTION OF STEAM AND HOT WATER — PROVIDING THE MOST EFFICIENT INSULATION AND PROTECTION



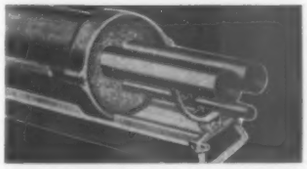
Ric-wiL INSULATED PIPE UNIT — SINGLE PIPE SYSTEM

Prefabricated complete units—pipe as specified, thoroughly insulated, in helical corrugated conduit, coated with asphalt and wrapped in asphalt saturated asbestos felt. All welded construction—pre-sealed in 21 ft. lengths for speedy installation. Filler-type insulation or sectional pipe covering.



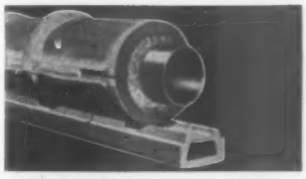
Ric-wiL INSULATED PIPE UNIT — MULTIPLE PIPE SYSTEM

Any specified combination of pipes, insulated and protected same as the single pipe system. Any or all of the pipe lines may be specifically insulated.



Ric-wiL STANDARD TILE CONDUIT

Vitrified glazed A.S.T.M. Standard Tile housing—acid- and weatherproof—with foundation type base drain supporting weight of piping through correctly engineered pipe support. For single or multiple pipe system—filler type insulation or sectional pipe covering.



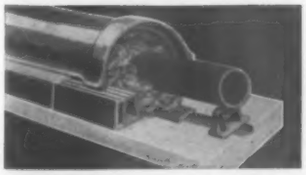
Ric-wiL SUPER-TILE CONDUIT

Same advantages as Standard Tile but with walls approximately double-thick for strength under heavy traffic or where overhead load is above normal. Will support static load of 6 tons per wheel under actual installation conditions. Base drain of extra-heavy tile.



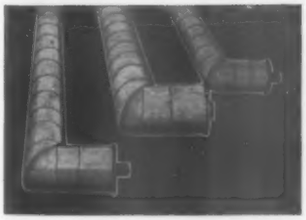
Ric-wiL CAST IRON CONDUIT

Heavy reinforced cast iron conduit for use where underground pipe lines run close to or under railroad tracks. Durable, water tight, vibration-proof, clamps for extra tightness.



Ric-wiL TILE CONDUIT — UNIVERSAL TYPE

Where installation conditions dictate the use of a concrete pad, Ric-wiL Universal Tile is recommended. Side walls are double-cell vitrified trapezoidal block design. Arch may be Standard Tile, Super Tile, or Cast Iron.



Ric-wiL CONDUIT ACCESSORIES

Ric-wiL accessories are available in all type systems: standard and special fittings, factory-fabricated or field-fabricated expansion devices, alignment guides, anchors, etc.

89 YEARS OF SERVICE

MUELLER CO.

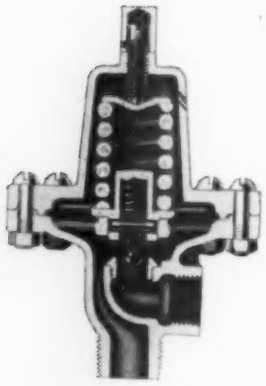
FOUNDED 1857

Decatur, Illinois

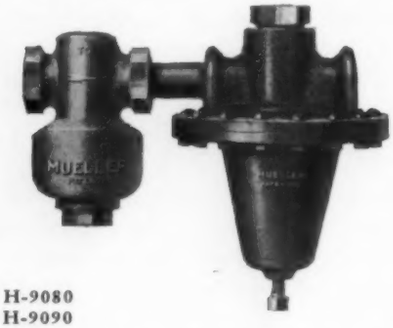
CHATTANOOGA, TENN. ★ LOS ANGELES, CALIF. ★ SARNIA, ONT., CANADA

MUELLER REGULATORS AND RELIEF VALVES

All MUELLER Relief Valves have the EXCLUSIVE AUXILIARY SPRING SEATING PRINCIPLE which prevents imbedded seat discs and insures instant relief within 5% of the pressure setting. Used to protect domestic hot water tanks, heating systems, etc. MUELLER Regulators have larger diaphragms to insure sensitive regulation and maintain steady outlet pressure even though the inlet pressure fluctuates considerably. All are well made of high grade materials by skilled craftsmen.

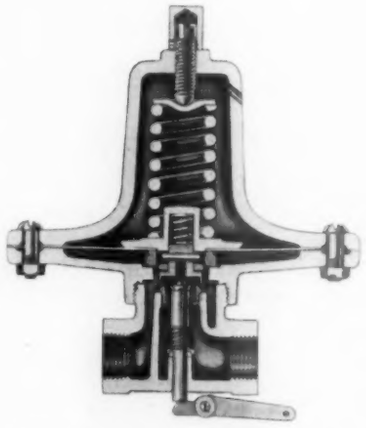


H-9045 Pressure relief valve without testing lever. Particularly adapted to hot or cold water, air or oil. Furnished for any pressure between 5 and 160 lbs. Made in ½″ size only, with ¾″ outside thread inlet; ½″ inside thread outlet

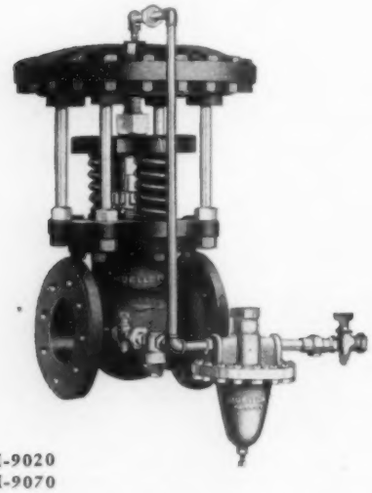


H-9080
H-9090

The H-9080 steam regulator and the H-9090 air or oil regulator are the direct operated type, and are recommended for large reduction requiring limited volume. Variation in inlet pressure does not affect outlet pressure. Furnished in sizes ¼″ to 2″ inclusive



The H-9052 is a larger diaphragm operated relief valve with testing lever, covering a wide range of capacity. This valve conforms to the A.S.M.E. Code and meets the requirements for large boiler installations. Furnished set for any pressure between 5 and 160 lbs., in sizes ½″, ¾″, 1″, 1¼″, 1½″ and 2″

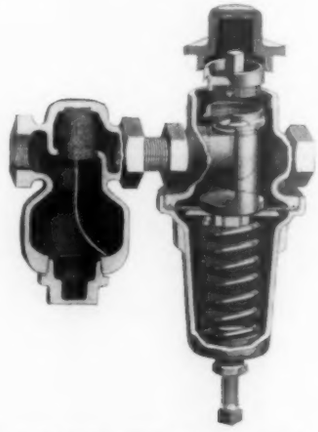


H-9020
H-9070

The H-9020 auxiliary operated regulator for water or air service can supply full pipe line volume at accurately controlled delivery pressures. Has large seat opening and bronze working parts. The H-9070 is of similar construction but designed for steam service. Both are easily adjusted, and are well adapted to industrial service. Sizes 1″ to 12″ inclusive



H-9030 The MUELLER Strainer is an inexpensive and reliable device which can be depended upon to stop foreign substances detrimental to every faucet and valve on the line. It soon pays for itself through a saving in repairs and maintenance. Regularly furnished with iron body; all bronze will be supplied upon order. Sizes ⅛″, ¼″, ⅜″, ½″, ¾″, 1″, 1¼″, 1½″, 2″, 2½″, 3″ and 4″



H-9000 This Pressure Reducing and Regulating Valve and Strainer is recommended where the pressure exceeds 45 lbs. Especially adapted for residence, apartment building and industrial service. Regulator is all bronze with iron body strainer. Bronze strainer will be furnished upon special order. Furnished for initial pressures from 45 to 250 lbs., with delivery from 25 to 75 lbs. Sizes ¼″, ⅜″, ½″, ¾″, 1″, 1¼″, 1½″, 2″ and 2½″

89 YEARS OF SERVICE

MUELLER CO.

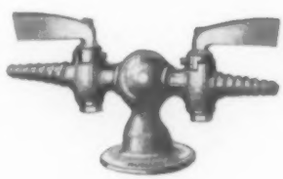
Decatur, Illinois

CHATTANOOGA, TENN. ★ LOS ANGELES, CALIF. ★ SARNIA, ONT., CANADA

FOUNDED 1857



H-12060 Pedestal Laboratory Fitting. Pedestal inlet ⅜" or ½" inside I.P. thread. Outlets at right angle. Flat lever handles. Tapered corrugations for hose



H-12050 Pedestal Laboratory Stop. Pedestal inlet ⅜" or ½" inside I.P. Thread. Tapered corrugations for hose connections. Also furnished as one stop, three stop and four stop fittings

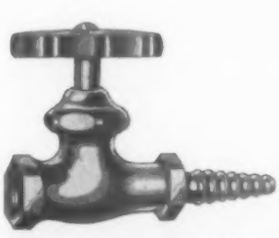


H-12015 Ground Key Laboratory Stop with tapered corrugation for hose. Flat lever handle. Inside I.P. Thread



H-12017 Ground Key Laboratory Stop with tapered corrugation for hose. Flat lever handle. Outside I.P. Thread

Furnished with indexed handles upon request



H-12020 Compression Laboratory Stop. Wheel handle and detachable hose nipple. Inside I.P. Thread



H-12040 Compression Laboratory Stop with detachable hose nipple and tee handle. Inside I.P. Threads



H-12010 Ground Key Laboratory Stop. Flat lever handle. Hose end has tapered corrugations. Inlet at right angle. Inside I.P. thread

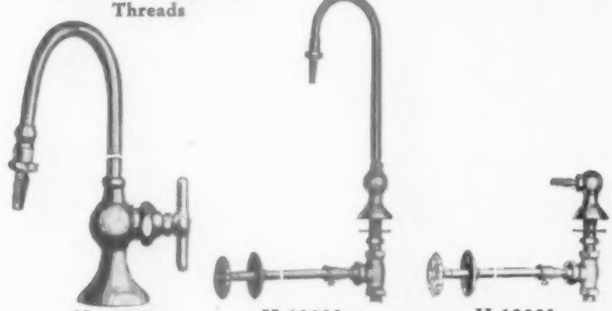
Furnished with indexed handles upon request



H-12080 Compression Swing Spout Faucet. Spout swings down into sink. Inlet and outlet have inside I.P. Threads



H-12085 Compression Double Swing Spout Faucet. Same as H-12080 except double supplies



H-12090 H-12092 H-12093

PANTRY FAUCETS

H-12090 Four Arm indexed (cold) Faucet regularly supplied
H-12092 Remote controlled with Wheel Handle
H-12093 Remote controlled with Wheel Handle and Turret Top. Can be furnished with one, two, three or four nipples in turret



H-12125 "Y" Connection. ⅜" outside I.P. Thread inlet with ¼" inside I.P. Thread outlet



H-12130 "Y" Connection. Inside I.P. Thread inlet with outside I.P. Thread outlet



H-12145 Nipple with outside I.P. Thread inlet and tapered corrugation for hose outlet



H-12183 Turret with one outlet. Can also be furnished for two, three, or four outlets

Send for a copy of Mueller Laboratory Brass Goods catalog. Fully illustrated with complete data as to sizes and finishes available

STREAMLINE PIPE AND FITTINGS DIVISION

MUELLER BRASS CO.

Port Huron, Michigan

PROTECT THE INVESTMENT FOR THE LIFE OF THE BUILDING BY INSTALLING *STREAMLINE* COPPER PIPE FOR THE PLUMBING AND HEATING SYSTEMS

STREAMLINE bronze solder fittings and copper pipe are a radical departure in conducting systems for plumbing, heating or industrial use. Their unique method of connection has made it possible to use copper piping of hard temper and of a sufficient wall thickness to meet all requirements of actual service. This is in direct contrast to threaded copper pipe, which had to carry a very heavy wall to insure a sufficient thickness to meet service conditions after this thickness had been cut away approximately 50% in the fabrication of the thread. Threaded copper pipe for this reason is naturally very expensive and gives no extra service for its additional wall thickness on the unthreaded portion.

STREAMLINE Solder Fittings are manufactured under U. S. Patents 1,770,852; 1,776,502; and 1,890,998



Illustrating Mechanical Features of the STREAMLINE Fitting

STREAMLINE solder fittings and copper pipe are installed at a price very slightly in advance of rustable materials.

STREAMLINE fittings and copper pipe are ideal for use in all types of educational buildings for all general plumbing and heating purposes: for steam supply, condensate return, cold water, drinking water supply and return, and hot water supply and return piping. Among the many advantages are:

High resistance to corrosion and clogging—Under normal conditions of soil and water, copper does not corrode or rust as iron or steel does. The absence of anchor points due to the continuously smooth waterway through pipe and fitting tends greatly to eliminate clogging.

Light Weight, yet great strength—The STREAMLINE solder fitting, less heavy and consequently less expensive for any given size, produces a connection that is enormously strong and leakproof.

Minimum space required—Although STREAMLINE solder fittings produce enormously strong joints, they are very little larger than the pipe lines which they connect. They do not protrude like screw type fittings. Since these fittings are not screwed into place when connected to the pipe and no space is required for wrench handling, etc., they can be installed very close to each other, thus saving considerable space.

Leaks due to vibration eliminated—Constant vibration has no effect on a joint made with STREAMLINE solder fittings. Its effects are not localized as is the case with screw type fittings, but are harmlessly dissipated throughout the system.

Visible proof an exclusive feature of the STREAMLINE Fitting.—When the mechanic installs STREAMLINE he can tell at a glance that the joint he has made is permanently leakproof without an actual pressure test. This is a valuable asset especially in concealed work.

The STREAMLINE solder fitting is not connected by threading or flaring but by soldering, utilizing one of nature's laws—capillary attraction—to form a permanently tight joint of great strength. The joint, in contrast to threaded connections, is actually reinforced and is the strongest point in the line, instead of the weakest.



Cut-away Sectional View of STREAMLINE Tee. Note How Pipe Is Recessed Into the Fitting, Resulting in a Uniform Smooth Waterway

The illustration herewith shows the mechanical features of the STREAMLINE solder fitting. After the joint has been fluxed and assembled in the pipe, it is heated and solder introduced through the feed hole. Capillarity immediately distributes it thoroughly and evenly between the bonding surfaces, producing a joint so strong that in a pulling test, the pipe will actually break while the joint remains without the slightest damage. It requires over 9000 pounds of pull even before the fracture in the pipe occurs. This, of course, is away beyond anything required of it in actual service.

ESPECIALLY RECOMMENDED FOR HEATING PLANTS

STREAMLINE hard copper pipe and fittings are particularly recommended for all heating plants—whether by hot water or steam.

If you place your hand within a couple of feet of iron or steel pipe in which steam or hot water is being conducted, you can feel the heat radiation. Try it with copper pipe and you will find that you must actually touch the pipe before you can determine whether it is hot or cold.

Copper Pipe transfers energy much quicker than iron or steel. Heat, of course, is a form of energy and in a hot water heating system or a steam heating system, the heat is transferred through the copper pipe to the radiators much quicker and with less heat loss. The reverse is also true. For instance, in large hotels where there are pipe lines circulating ice water, the temperature of the water remains lower than if it is conducted through iron or steel.



Coupling



Tee



Elbow

In many cases the expense of insulating copper pipe may be eliminated. Copper will only radiate heat if inclosed in a drafthead or flue or if there is a continuous moving current of air around it. The modern concealed copper radiators which we find in buildings, generally beneath the windows, could not function unless they were inclosed so as to permit the air to travel over their surfaces by entering at the bottom and emerging at the top. A STREAMLINE system actually cuts your fuel bill.

STREAMLINE pipe and fittings are installed in over four hundred schools and colleges throughout the United States and, in fact, in every type of building construction. They have been specified by leading architects everywhere.

STREAMLINE fittings are furnished in complete range from ¼" to 10".

The word STREAMLINE is the Registered Trade Mark of the Mueller Brass Co., Port Huron, Michigan



Cross

Write for Catalog.

GRINNELL COMPANY, INC.

EXECUTIVE OFFICES
Providence 1, R. I.

BRANCH OFFICES IN PRINCIPAL CITIES OF UNITED STATES AND CANADA

GRINNELL AUTOMATIC SPRINKLER SYSTEMS FOR SCHOOLS AND COLLEGES



*Quartzoid * Bulb Sprinkler*



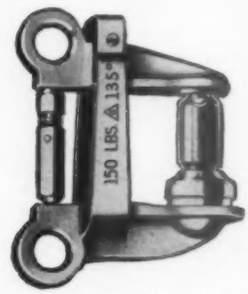
Sidewall Sprinkler



*DuraSpeed * Sprinkler*



Ornamented Type Sprinkler



*Quartzoid * Bulb Link for Fire Doors*

GRINNELL AUTOMATIC SPRINKLER SYSTEMS

There is a type of Grinnell Automatic Sprinkler System or Fire Protection Equipment to safeguard practically every standard or special hazard risk.

GRINNELL Automatic Sprinkler Systems are installed in all types and sizes of industrial, commercial and institutional buildings. Some properties are protected by either a Grinnell Standard Wet-Pipe System, a Grinnell Standard Dry-Pipe System —or by a combination of both systems, depending upon temperature conditions. Others are safeguarded by the specialized Grinnell Multitrol System.

Thousands of fires have put themselves out in factories, warehouses, skyscrapers, stores, theatres, hotels, piers and docks, hospitals, schools and colleges, churches, institutions, ships—and in many other properties protected by Grinnell Automatic Sprinklers. Such property values exceed fifty billion dollars. And millions of lives are being protected daily by these Sprinklers—ingenious little devices constantly on the alert to quench a fire at its start.

More than 70 years of installation experience in various types and sizes of buildings have given Grinnell Engineers a background and training to cope with any fire protection problem encountered in any property under consideration. During this time, Grinnell Automatic Sprinklers have extinguished, with trivial losses, thousands and thousands of fires which otherwise would have developed into serious losses in life and property.

SCHOOL FIRE LOSSES HEAVY

Despite the fact that modern construction, fire-resistive building materials, proper exits, fire drills, etc., are being used to combat it, fire is daily exacting a heavy toll in schools and colleges. So-called "fireproof" buildings can serve as stoves in which contents can burn.

Authentic records show that during 1945 alone, fires caused a property loss of over $6,042,500.00 in such buildings. As for the loss of life, no money value can ever measure the sorrow in any family where a child was burned to death or seriously crippled.

SPRINKLERS ASSURE PROTECTION

The surest way to prevent fires in school and college properties is to install a Grinnell Automatic Sprinkler System. On silent duty day and night, year in and year out, it will stand guard, ready to quench a fire at its start. Statistics show that automatic sprinklers are proving 93% efficient in banishing the danger of fires in all types of school buildings.

REDUCED INSURANCE RATES

In addition to assuring adequate protection to life and property, the installation of a Grinnell Automatic Sprinkler System generally results in insurance rate reductions ranging from 50 to 90%. Such savings can be applied toward payment of the system and, after payment is complete, they prove an excellent return on the investment throughout the life of the building.

ESTIMATES WITHOUT OBLIGATION

Hundreds of schools and colleges are enjoying the many benefits a system of Grinnell Automatic Sprinklers assure. Surveys and estimates for any particular building will be gladly furnished without cost or obligation. A request to any of our offices in principal cities or to Grinnell Company, Inc., 277 West Exchange Street, Providence 1, R. I., will receive prompt attention.

* Reg. U. S. Pat. Off.

CRANE CO.

CRANE Plumbing, Heating, Pumps, Valves, Fittings, Pipe

General Offices: 836 South Michigan Avenue, Chicago 5, Illinois

NATION-WIDE SERVICE THROUGH BRANCHES, WHOLESALERS, PLUMBING AND HEATING DEALERS

Quality Plumbing and Heating for Every Need in Schools and Universities

Proper sanitation . . . long life . . . low maintenance costs . . . dependable service—these are the requirements of good school plumbing. And these are the requirements Crane plumbing satisfies. For as always, careful planning, expert workmanship, and sturdy construction guard the quality of Crane plumbing.

In addition to quality fixtures, the Crane plumbing line includes everything in plumbing for schools and universities—valves, fittings, and all necessary piping. Fixtures are made of vitreous china and Crane vitreous glazed Duraclay—both assure lasting beauty and ease of cleaning. All mechanical parts are ruggedly constructed to stand up under the severe usage to be expected in public washrooms.

Here are shown just a few fixtures from the complete Crane plumbing line. For further information consult your Plumbing Contractor or call your nearest Crane Branch.



CE12-096—Santon elongated rim, siphon jet closet with concealed pressure tank and seat-operated flush valve—open-front wood seat.



CB11-380 — Rapidway blow-out wall-type closet with elongated rim, flush valve and vacuum breaker. Supplied with open-front plastic seat.



CB 4711 — Shower cabinets — white baked enamel finish. Supplied with soap dish and pre-cast cement receptor. Has 2-valve shower with polished brass connector. Over-all size 32 x 32 x 75".



CB 754—Norwich vitreous china lavatory with rectangular basin and moulded-in soap depression. Supplied with pop-up waste fitting. Sizes: 18 x 15", 20 x 18" and 24 x 21".



CB 625—Yorkshire vitreous china lavatory with raised shelf back. Supplied with single-spout mixing faucet, chain and stopper. Sizes: 18 x 15".

Everything for the Heating System

The complete line of Crane heating equipment includes boilers, radiators, controls, specialties, pipe, valves and fittings—everything necessary for every type of heating system in schools and universities.



Sectional Boilers, up to 1,560,000 Btu. net capacity.



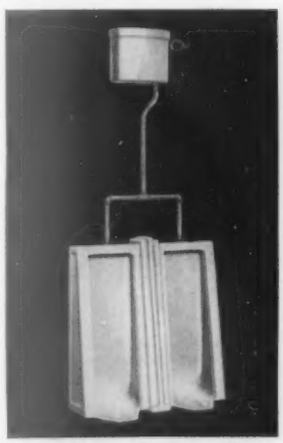
Compac Radiators, Slim tube — 3 to 6 tubes. Height 19 to 32".



Coal Stokers, from 60 to 350 pounds-per-hour capacity.



Specialties: Boiler feeders, low-pressure pop safety valves, radiator venting valves, and all necessary specialties for every heating system.



CB15-390 — Sanitor vitreous china, slope front urinal stalls available as individual fixtures or in batteries. Has antisplash rim. Tank is vitreous china with automatic flushing action. Over-all width each unit 18".



CB15-605 — Correcto vitreous china urinal, easily cleaned. Integral strainer and trap. Extended shields and exposed flush valves. Can be installed in batteries with single flushing tank. Over-all width 18".



CB 9002—Corwith vitreous china drinking fountain. Sanitary angle stream jet with vandal-proof base. Automatic stream regulator.

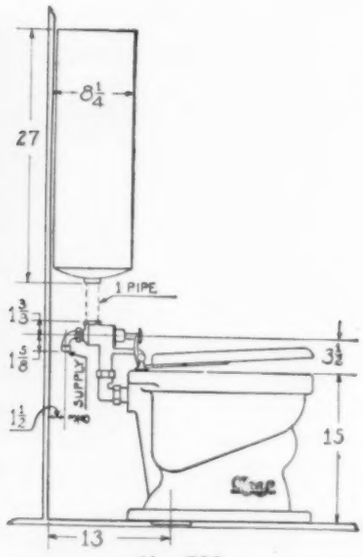
THE PHILIP HAAS COMPANY

ESTABLISHED 1896

Dayton 2, Ohio



No. 700



No. 700

Haas

Automatic Pressure Tank Closets

THESE CLOSETS are designed especially for installation in schools, institutions, comfort stations and all public places where closets must withstand the hardest kind of use and abuse under all conditions, whether or not they receive much care or attention. They are automatic and flush each time the seat is released.

All closets are equipped with the Haas MASTER Valve made entirely of brass and with phosphor bronze spring. There are only two washers in entire assembly, made of leather and encased in brass. They can be replaced simply by unscrewing the packing nut and it is not necessary to disconnect the valve to replace them.

This equipment requires only ⅜" supply and a maintained minimum water pressure of 25 pounds.

No. 700 — Includes Haas MASTER Seat Action Valve and fittings, sanitary open front and back hardwood seat with reinforced hinge; 8" x 24" galvanized pressure tank, and extra heavy twice-fired vitreous china washdown bowl.

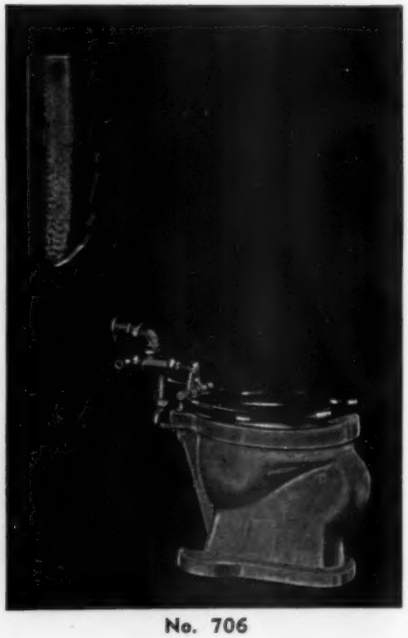
No. 706 — is same as No. 700 but with connections for concealing tank in wall as illustrated.

EXTRAS

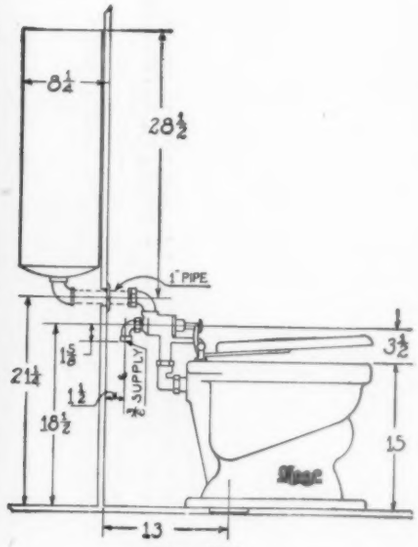
Hard Rubber Seat Wings
Self Raising Seat
White Enameled Tank
Approved Vacuum Breaker
Siphon Jet Bowl
Stop and Supply to Wall

This Equipment Can Be Used on Old Bowls of Regular Type — Write for Information

CATALOG AND PRICE LIST AVAILABLE ON REQUEST



No. 706



No. 706

QUALITY PRODUCTS FOR 50 YEARS

THE HALSEY W. TAYLOR CO.

Manufacturers of Drinking Fountains and Coolers

Warren, Ohio

AGENTS IN PRINCIPAL CITIES

PRODUCTS

Halsey Taylor Drinking Fountains; Combination Cooler Drinking Fountains in Iced Water or Electric Types.

DISTINCTIVE FEATURES THAT APPEAL TO ARCHITECT AND SCHOOL AUTHORITIES ALIKE

It was during the first World War that Halsey Taylor Drinking Fountains were introduced. Today, they are still accepted among the country's foremost fountains, because of their modern design, their distinctive patented features that spell convenience and sanitation alike, and their wide variety of models from which to choose. That is why they are still a preferred specification of architects and builders, whether for schools or other public buildings; industrial plants, hospitals or churches.



You buy more than a mere fountain when you buy Halsey Taylor Drinking Fountains. You buy definite assurance of trouble-free service, positive health-safety, maximum convenience, built-in patented features exclusive with Halsey Taylor!

It is in school operation that a fountain finds its greatest use as a factor in hygiene. When pupils drink from Halsey Taylor Fountains day after day, it is this assurance of health-safety that more than pays for the care in selecting the right make of fountain—and that make usually is Halsey Taylor, practically a standard in school installations the country over. Their most valued features are:

1 — Practical Automatic Stream Control

An automatic device maintains constant height in drinking stream regardless of line pressure variation. Stream never too high, never too low.

2 — Ideal Drinking Mound

The two-stream projector with latest type guard makes the side stream both practical and health-safe, removing objections found with ordinary side-streams.

3 — Definite Sanitation

Drinking mound is formed by the converging of two streams of water, setting up a localized drinking mound which makes it impractical to drink from any other point but the ideal height of the mound. Fingers or lips cannot come in contact with or contaminate water source. It is impossible to squirt the water.



Pedestal Type—No. 3916



No. 3914



No. 3901

One of many attractive pedestal and wall types

Battery Types

Many two- and three-part battery types especially adapted to school installations



No. 3912



No. 2703

FOUNTAINS FOR EVERY REQUIREMENT

These pages show a few of the various types of Halsey Taylor Drinking Fountains. There are many models from which to select, all most modern in styling, all with the fundamental Taylor features. Send for catalog.

GENERAL ELECTRIC COMPANY

APPLIANCE AND MERCHANDISE DEPARTMENT

Bridgeport, Connecticut

Wiring Materials for Complete Wiring Systems In Schools and Colleges

Good electrical wiring is of first importance in modern schools and colleges. Lighting depends on it. Electrical equipment in laboratories, auditoriums, offices and service rooms also depends upon it. Adequate wiring systems should be installed in new buildings, of course, and in many cases the wiring in existing buildings should be modernized. High quality wiring materials should be used to provide long, trouble-free service and to avoid expensive repair and replacement jobs.

G-E WIRING MATERIALS. G-E wiring materials are good materials to use because they are carefully made of the finest raw materials. They have uniform high quality and will give long, dependable service. The line includes conduit products, wires and cables and wiring devices — all the materials needed for wiring any school or college building.

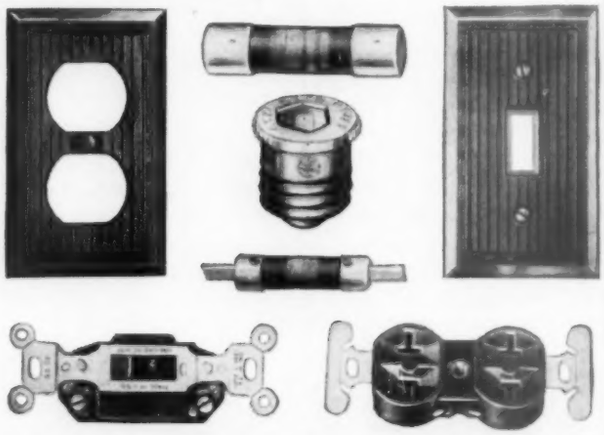


G-E CONDUIT PRODUCTS. Here are zinc-coated G-E White rigid conduit, enamel-coated G-E Black rigid conduit and electrical metallic tubing. There are also many G-E boxes and fittings to use with conduit wiring and with the cables. These materials will meet different wiring needs.

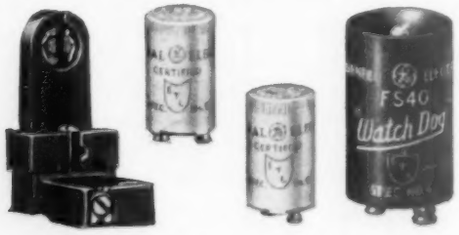


G-E WIRES AND CABLES. In this high quality line are thermo-plastic insulated building wires, Type T for general purpose wiring and Type TW for wiring in wet locations. These wires are small in diameter, resistant to oils, acids and alkalies and are flame retarding. Other wires in the line include Type R, Code Grade; Type RH, Heat Resistant Grade; and Type RW, Moisture Resistant Grade. There are also a variety of portable cords. G-E cables available include BX*, PVX*, BraidX* and service entrance cables.

** Trade Mark Reg. U.S. Pat. Off.*



G-E WIRING DEVICES. There are literally hundreds of G-E wiring devices—switches, convenience outlets, plates, lampholders, enclosed cartridge fuses, plug fuses, etc. All of these devices are high quality. They are ideal for serving, controlling or protecting lighting or electrical appliances or equipment.



G-E FLUORESCENT ACCESSORIES. General Electric manufactures a complete line of fluorescent accessories which consist of starters, lampholders and starter sockets. G-E lampholders and starters are available for all types of fluorescent lamps ranging from mogul to miniature sizes.

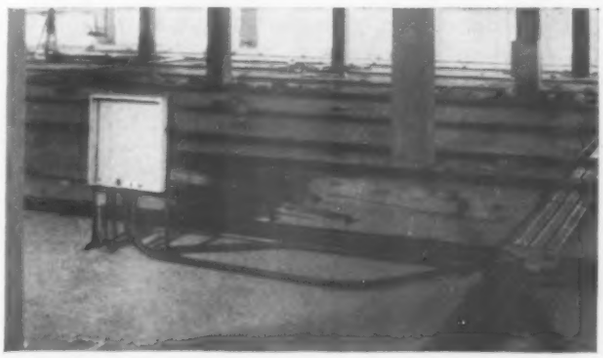
FOR FURTHER INFORMATION

on G-E Conduits, Wire and Cables, Wiring Devices or fluorescent accessories, see the G-E Merchandise Distributor near you or write to Section C15-226, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.

FOR UNDERFLOOR ELECTRICAL DISTRIBUTION

General Electric offers two types of underfloor wiring. Both give almost unbelievable electrical flexibility. This method of wiring is particularly suited for laboratories, libraries, offices, work shops, etc. With it electrical outlets can be installed as they are needed. Lights and equipment can be changed at will. Power, telephone and signal service can be accommodated.

Specify G-E Fiberduct with Masonry and Wood Type Construction



Here G-E Fiberduct underfloor raceways are being installed in a triple grid layout. Note conduit connection between Fiberduct and panel board.



This high school laboratory has G-E Fiberduct raceways under the floor. All machines are fed from the Fiberduct Underfloor Wiring System.

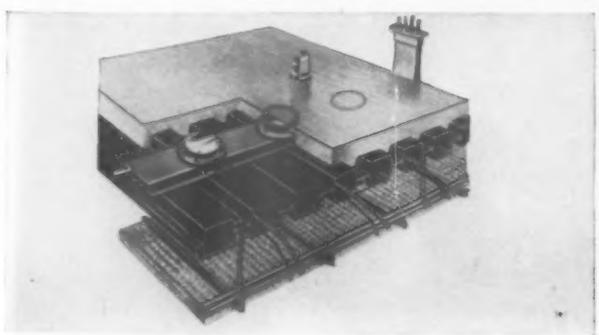
Specify G-E Q-Floor Wiring with Robertson Q-Floors



G-E Q-Floor Wiring installation. Header ducts are shown running across the cells of the floor at right angles. The header ducts are feeder raceways for conductors to reach cells. Outlets are installed in cells.



Here outlets are shown at every desk served by G-E Q-Floor Wiring.



Cutaway diagram of G-E Q-Floor Wiring showing floor cells, header duct and outlet. Outlets can be placed anywhere over cells carrying wires.

Additional Information

For further information on G-E Fiberduct underfloor raceways and on G-E Q-Floor Wiring for Robertson Q-Floors, see the nearest G-E Merchandise Distributor or write to Section C15-226, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

THE CINCINNATI TIME RECORDER CO.

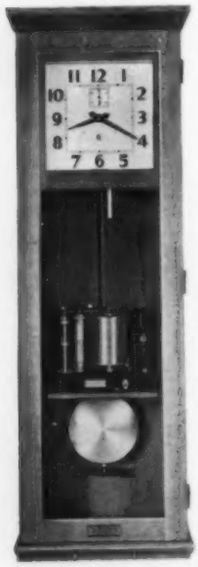
1733 Central Avenue, Cincinnati 14, Ohio

CINCINNATI-LANDIS TIME is our BUSINESS!

SCHOOL MANAGEMENT is Big Business. For almost half-a-century CINCINNATI-LANDIS Clocks, Signaling Systems and CTR Time Recorders have provided dependable, accurate service to schools and colleges. Complete information on master and secondary clocks — program machines — push button boards — program bells, buzzers, horns — employees' time recorders—time stamps—synchronous program systems, etc., gladly sent on request.

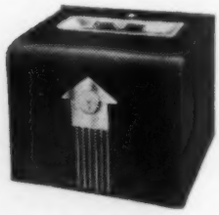
"PRECISION-BUILT" MASTER CLOCK

Extreme flexibility and infinite variety of combinations of time instruments is afforded by the use of this equipment. Any number of secondary clocks, Program Machines, Attendance Recorders, and Time Stamps, can be connected with, operated and controlled by one Master Clock. A synchronization control device automatically switches on once each hour to reset any or all secondary instruments which, through failure of the electric current, or other causes, may not be exactly in time with the Master Clock. Metal Ball, Mercurial pendulums, sixty beat types with wall hanging surface or flush type case and full length heavy glass paneled door.



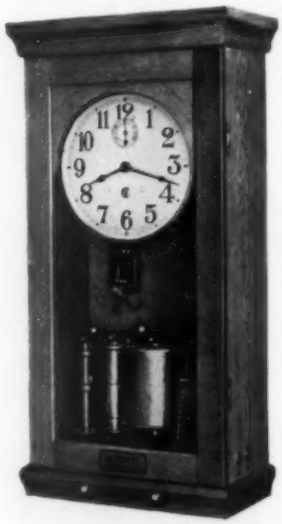
CINCINNATI "F P 800"

This Electric Model Recorder is especially distinguished for its simplicity and solid, sturdy construction, which means long wear and trouble-free performance. An inexpensive General-purpose Recorder for Employees-attendance and Job-Labor Time Recording. Fully Automatic Time Progression — no manual setting — UP-THE-CARD Positioning for Wall or Table Mounting. In metal case 11½" high, 14½" wide, 12¼" deep.



"PRECISION BUILT" PROGRAM CLOCKS

Cincinnati-Landis Electric Program clocks provide the most modern automatic schedule-signaling equipment today. Ranging from simple limited control types to fully automatic, high capacity types. These Program clocks are guaranteed to give dependable, accurate performance over a long period of years. Moderate first cost and minimum cost of operation are inherent and highly desirable features of these time signaling instruments. Any size system available from simple 2 station to the most elaborate, many station installations. Synchronized motor drive-minute interval type. Fully automatic, adjustable to a wide variety of program time requirements.



SECONDARY CLOCKS

Synchronous motor, wall and ceiling types, represent the peak of engineering skill and "Precision" manufacture. These clocks are dependable, accurate, noiseless, and available at a price that permits general installation in classroom, corridors, offices, etc. Available in various dial sizes. Case of spun metal, finished to sample. Wall and ceiling bracket or chain suspension.



Consult CTR representatives without obligation regarding your timekeeping, time signaling and time recording problems. Distributors in Principal Cities

EDWARDS

ELECTRICAL SIGNALING, COMMUNICATION AND PROTECTION EQUIPMENT

EDWARDS AND COMPANY, NORWALK, CONN.

In Canada: EDWARDS AND CO. LTD.

SALES OFFICES AT: Atlanta • Baltimore • Boston • Charlotte • Chicago • Cincinnati • Cleveland • Dallas • Denver • Des Moines • Detroit • Jacksonville • Kansas City • Los Angeles • New Orleans • New York • Omaha • Philadelphia • Pittsburgh • San Francisco • St. Louis • Seattle • Syracuse • Washington, D. C.

★ *CLOCK AND PROGRAM SYSTEMS*

★ *SCHOOL TELEPHONE SYSTEMS*

★ *SCHOOL FIRE ALARM SYSTEMS*

GENERAL PRINCIPLES TO GUIDE YOUR CHOICE OF CLOCKS, PROGRAMS AND SIGNALS

Edwards and Company manufactures a wider selection of signaling equipment than any other manufacturer and the purpose of this listing is to show briefly the best, the most practical and most dependable. That does not mean the most expensive. Instead of confusing you with many alternatives, we give you here a dependable recommendation based on years of research. Some explanations follow: Synchronous Clocks show the correct time at each second of the day and night, are noiseless and dependable. They are a logical and modern advance over the old "minute jumper" clocks which were noisy and only changed time at each minute. Automatic Resetting with dual motored clocks is certainly a modern necessity, and represents a minute fraction of the cost of any up-to-date building. A janitor travelling from room to room with a step ladder is a long and undependable process. Manual correction from a central push button is a poor substitute. Correction by overspeeding a single motor clock is an unnecessary strain on wearable parts.

A Program Instrument is the only way to assure smooth, systematic and punctual change of classes in any school no matter how small. To omit it and depend upon a principal or student pushing buttons at the right moment is false economy. Flush 12" Clocks are recommended. They cost no more than surface clocks, and a well designed building deserves their neater appearance. The 12" size has proved to be best for all locations.

Room Signals should be loud enough but not startling. The old idea of very loud corridor signals (and no room signals) is distinctly outmoded, first because noisy schools are inefficient schools, and also because all rooms do not change at the same time. A chime is best, a buzzer in the clock case next best.

Loud signals should be used in such locations as gymnasiums, lavatories, swimming pools, vocational rooms and outdoors. A 6" bell is best, a horn second best. Outdoor signals should be watertight, and built to stand abuse. For added protection, a hood is recommended.

Avoid Confusion. There is no economy in trying to make one system do three jobs poorly instead of one job well. Don't try to make program bells call the teacher to the telephone; don't risk lives by having "three rings" on classroom bells warn of fire instead of having a fire alarm system designed for the job.



Edwards No. 1962 flush wall clock with 12" dial for classroom, corridors, etc.



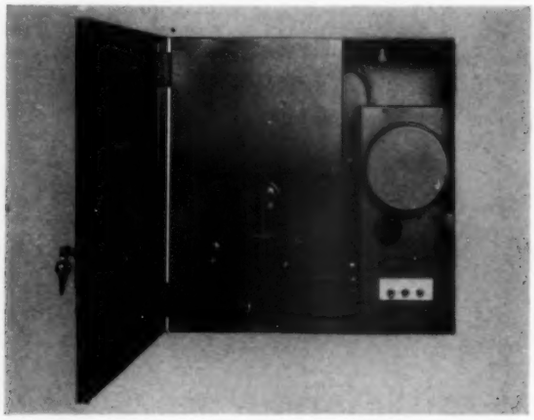
Edwards No. 1978 double dial 12" clock for corridors, etc. Suspended from ceiling or side wall as desired



Edwards No. 1972 surface clock with 12" dial for existing buildings

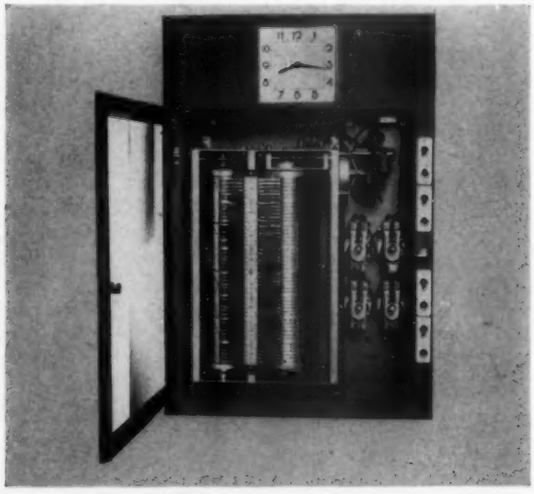
See following pages of description for other signaling equipment

PROGRAM INSTRUMENTS — CONTROL BOARDS



CLOCK SYSTEM CONTROL

When clocks, signals and instruments operate as a system with common current supply, the central control permits easy, accurate correction for power interruptions. The Automatic Control measures length of power interruption and causes clocks to operate from a second motor at an accelerated rate to correct time. Unit includes manual switches for daylight saving time corrections. Edwards No. 1902 automatic control is enclosed in metal cabinet with lock and key. Dimensions 18" x 18" x 6" deep. For flush mounting, add 2" to height and width, and allow 5¼" for box. Also available in manual control type No. 1900. Details on application.

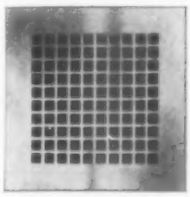


PROGRAM INSTRUMENTS

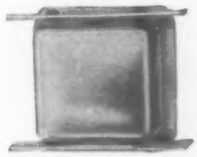
If every room in the school operates on the same schedule (or program) every day in the week, a one-circuit program instrument will suffice. An additional circuit is necessary for every day that the schedule differs and when any grades operate a different daily schedule. If the school has only daytime sessions, or operates on any night schedule, a 24-hour program is standard. The multiple-circuit program instrument is available in 2, 4 and 6 circuit sizes. Program is set by inserting pins in cylinder holes. Signal duration is adjustable from 2 to 6 seconds. The multiple-circuit device (No. 1918 four-circuit illustrated) is enclosed in metal cabinet. Edwards No. 1910 Single Circuit Program Instrument for smaller installation. Details on application.

AUDIBLE SIGNALS

CHIMES FOR CLASSROOMS



No. 1985—Flush chime, two note, with wall box



No. 1984—Surface chime, two note

A chime signal has a more penetrating tone than a bell and without objectionable shrillness. Its pleasant musical note recommends it where the sharp piercing note of the ordinary bell would be out of place. Chimes are available in two types, for surface mounting and for flush mounting. Both chimes have a pleasing two-note sequence. The flush chime is mounted in a flush wall box and has an attractive grille. The surface chime is a simple neutral design to harmonize with the interior of the classroom. Finish, satin aluminum.

BUZZERS

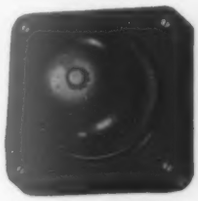
Edwards No. 1983 Buzzer may be housed within the clock outlet box. Used in this way it takes no room or wall space, saves an additional outlet, and therefore is often preferred as a room signal. If found desirable to mount the buzzer separate from the clock, it is simply mounted in a single gang box for flush mounting or Wiremold fitting for surface use. Buzzer is adjustable for volume. Plate not furnished.

No. 1983. Buzzer, 115 volt—60 cycle, Approximate Shipping Weight—6 oz.

BELLS



No. 560—8" Bell



No. 1987—4" Bell

The Adaptabel's simplicity of installation and excellent tone quality make it ideal for use in corridors, playrooms, lavatories, vocational rooms, gymnasiums and classrooms. The 3" size is for classroom use, the 4" or 6" bell is used in playrooms, corridors, and vocational rooms. Mounts directly on wall box.

6" to 12" bells have back plates that mount directly on the wall for open wiring or on standard boxes. Electrical connections are made on this plate. The bell hangs on two lugs on the plate and is pressed home to make contact. The 6" size is recommended for corridors and gymnasiums; 10" and 12" bells for outdoor mounting.

MODEL NO.	DESCRIPTION
1987	3" Bell
1988	4" Bell
560	6" Bell
560	8" Bell
560	10" Bell
560	12" Bell

Add letters "WPF" to catalog number if for outdoor mounting. And for this service, a No. 1995 guard is recommended. See listing below.

HORNS

Edwards Horns are powerful, pleasing-appearing signals. A back plate mounts directly on the wall for standard boxes, making mounting a simple, easy job. Available in two types—for indoor and outdoor applications. Yard type guard is recommended for use with outdoor type horn.



No. 311. Indoor Type Horn 115 volts 60 cycles, 5 lbs., 3 ozs., shipping weight.

No. 1994. Outdoor Type Horn, 115 volts 60 cycles, 5 lbs., 3 ozs., shipping weight.

No. 1995. Yard Type Guard for No. 560 WPF 6" and 8" Bells or No. 1994 Horn.

No. 1996. Yard Type Guard for No. 560 WPF 10" and 12" Bells.

SCHOOL TELEPHONES AND SCHOOL FIRE ALARM SYSTEMS



FOR CLASSROOMS

Flush telephone instrument for classroom is attractive, modern and can be painted (on the job) to match wall color. High quality precision instrument. Edwards No. 2130.

FOR PRINCIPAL'S OFFICE





With Edwards Telephone Instrument for principal's office, it is no longer necessary for the principal to leave his desk to ring the desired classroom, then return to his desk. Edwards No. 4653 Cradle Desk Telephone is available with buttons on the instrument. For side of desk mounting, telephone handset No. 4665 with separate push button pad, mounted on top of desk is recommended.

TELEPHONE SWITCHBOARDS FOR LARGER SCHOOLS

Edwards has specialized in the telephone switchboard for schools, institutions, etc. Larger schools require communication between rooms and the interior switchboard is the most satisfactory for this purpose.



SCHOOL FIRE ALARM SYSTEMS

THE Edwards Closed Circuit Coded Fire Alarm Systems (SS for D.C., and SSA for A.C. Operation) are accepted as standard by practically every fire prevention authority in the United States and Canada, and in addition are approved by the Underwriters' Laboratories. Operation of any station sounds that station's code, and shows its location. Each station has its own code mechanism, so failure of one station does not make the system inoperative.

The Control Panel is the nerve center of the system. The number of circuits depends upon the number of signals. The control panel contains relays to supervise the circuits electrically. It is also provided with milliameter, fuses, resistance units and necessary terminals for all wire connections. The panel is enclosed in a steel cabinet suitable for surface or concealed wiring, as specified. A trouble bell is provided which rings constantly in case of an open circuit or other disarrangement until the trouble is removed.

SOUND SYSTEMS AND TEST PANELS

Current paper shortages prohibit adequate space to describe and illustrate Edwards Sound Systems and Test Panels. Complete details will be furnished on application.

INTERNATIONAL BUSINESS MACHINES CORPORATION

WORLD HEADQUARTERS BUILDING
590 Madison Avenue, New York 22, N. Y.

AUTOMATIC
Administrative Aids



IBM Engineering Laboratory
Endicott, New York

IMPORTANT ADMINISTRATIVE

Call IBM for descriptive literature and technical information on any of the following types of equipment. There are many models of each type, arranged for specific applications.

IBM *Self-Regulating Time Indicating and Signal Systems*

MASTER CLOCKS: The "chief executive" of an accurate and coordinated time system.

PROGRAM CLOCKS: Self - contained units to control any schedule of signals through one or more circuits.

PROGRAM CONTROLS: Arranged to meet schedule and circuit specifications and operate as part of self-regulating time system.

SECONDARY CLOCKS: Visual accurate and uniform time throughout all working areas of any type building. Available in a wide variety of models and sizes for interior and exterior installation. Also built to special design.

TOWER CLOCKS: Motor drive movements operated as part of self-regulating system. All sizes for one, two, three or four dial installations with Westminster and Hour striking bell attachments.

SIGNALS: Bells, buzzers, horns, sirens—all standard sizes and voltages for interior and exterior installation.

ATTENDANCE RECORDERS: Complete range of types to meet every attendance time recording requirement.

JOB RECORDERS: For securing elapsed time on jobs, operations, and processes, a complete range of models to meet every need in distribution of labor costs.

TIME STAMPS: A printed time record on correspondence and documents to establish time of receipt and dispatch, and to place responsibility.

For Assistance in Preparing Equipment Specifications and Layouts, or to Obtain

AIDS FOR MODERN BUILDINGS

Every school building has need for some of these products. Modern administrative control through the use of these systems is essential for the small as well as the large school.

Other IBM *Communicating Systems and Equipment*

WATCHMAN'S CLOCKS: Provides a record for supervising watchmen by recording time on scheduled routes of inspection.

RECORDOLOCKS: Gives a printed record of when and by what key the door is locked and unlocked.

CENTRAL CONTROL SOUND EQUIPMENT

Many different models of control cabinets to provide music and speech distribution to one or a group of reproducers. Special features furnished to meet individual system requirements.

A wide selection of reproducers, microphones and accessories.

FIRE ALARM EQUIPMENT

A complete line of electro-mechanical control equipment to provide protection for lives and property.

Stations furnished in flush and surface mounting in all types.

INTERIOR TELEPHONE SYSTEMS

Control units furnished in common talking type, and also private talking with either switch or automatic dial control, exclusively for private interior systems.

Telephone sets for classrooms, motion picture booths, and cradle type for desk use.

LABORATORY PANELS

Voltage distribution experimental panels for use in science laboratories and industrial plant engineering departments.

Descriptive Literature, Contact the Nearest IBM Branch Office Listed on the Following Page

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Phoenix . . . . . 821 N. Central Ave.

ARKANSAS
Little Rock . . . 225-227 Louisiana St.

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Oakland . . . . . 347 13 St.
Sacramento . . . . . 1015 13 St.
San Diego . . . . . 1269 Fourth Ave.
San Francisco . . . . . 25 Battery St.
San Jose, P. O. Box 879, E. St. John and N. 16th St.

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IBM
INTERNATIONAL BUSINESS MACHINES CORPORATION

THE STANDARD ELECTRIC TIME COMPANY

Founded 1884

Springfield 2, Mass.

Please Mention This Publication When Writing

PRODUCTS FOR EDUCATIONAL INSTITUTIONS

ELECTRIC CLOCK AND PROGRAM SYSTEMS

FIRE ALARM SYSTEMS TELEPHONE EQUIPMENT

LABORATORY PANELS ELECTRIC SHOP EQUIPMENT

BRANCHES

Atlanta
Birmingham
Boston
Buffalo
Chicago
Columbus
Dallas
Denver
Houston
Kansas City
Los Angeles
Minneapolis
Montreal
New Orleans
New York
Philadelphia
Pittsburgh
St. Louis
Salt Lake City
San Francisco
Scranton
Seattle
Tampa
Washington

"STANDARD" ELECTRIC CLOCK AND PROGRAM SYSTEM

This is a centrally controlled system with secondary clocks and program machine synchronized with the master clock on minute impulses. The entire equipment is operated from the 115 AC through 24 V DC dry plate rectifier and is arranged so that all clocks and program machine are automatically reset hourly by the master clock in case of current failure or other irregularities on the minute impulse system. This correction covers a total span of 25 minutes either fast or slow in one hour.

The master clock can be provided with an "accumulator" at additional cost which will compensate for longer periods of current failures up to 12 hours.



"Standard" Master Clocks

These are regularly made in the 60-beat size with several standard case designs for wall or flush mounting. They are automatically wound and models are made to run 1 hour, 12 hours or 8 days in case of current failures.

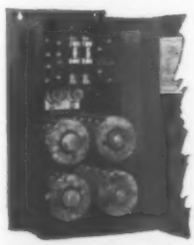
Pendulums — Metal ball type regulate within 30 seconds per month, mercurial or invar, 10 seconds per month.

The Program Machine—either the ribbon or metal disk type—may be placed in the master clock case as illustrated, or at an additional cost, in a separate case as shown below.



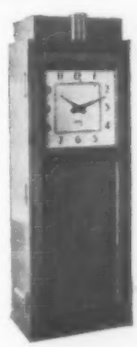
"Standard" Program Machines

These machines are minute interval, furnished in either the tape or disk type, and are built for 2, 4 or 6 program schedules of 12 or 24 hours' duration. They have automatic calendar devices to silence the signal nights, Saturdays, Sundays or any 12-hour period. Push buttons and switches are provided for manual operation when desired. Cases for surface or flush mounting as specified. Cut shows bell board in same case.



Rectifiers

"Standard" Rectifiers are of the stable voltage copper oxide type, and made in sizes from 2 amperes up for the specific jobs they are called on to perform. The standard voltage for clock systems is 24. Rectifiers with proper filter are made for operating the telephone equipment.



Synchronous Motor Master-Program Clock

This is an efficient moderately priced program clock and ideal for small schools where a limited amount of money is available. It has a 2 or 4 program schedule machine of the tape type, run by a 115 V AC 60 cycle synchronous motor from the lighting current (regulated frequency). The program machine and the 12" dial hands are directly geared together thus making it impossible for the clock and program to get out of step with each other.

The unit has a small red tell-tale signal which appears in case of current failure, and the clock can be reset to correct time by means of a knurled knob in back.

This unit is provided with a 12 V rectifier to operate the signal relays and also up to 6-12" dial impulse secondary clocks. It does not have any automatic reset feature as the 60 beat pendulum clocks, but is furnished with a manual step-up switch to advance the secondary clocks to the correct time after a current failure.



Program Signals

Buzzers — Type MA

These buzzers are furnished with plate for mounting on a single gang box or arranged for mounting in the secondary clock case. They are made for 24 V AC or DC also for 115 V AC operation.



Underdome Gongs — Type MAPL

These gongs are made in 3", 4", 6", 8" and 10" sizes and provided with plate for mounting on a single gang box. The 6" size is recommended for corridors, cafeterias, gymnasiums, etc., and the 10" with a weatherproof housing, for outside use.

SECONDARY CLOCKS

Secondary clocks are of the automatic reset, minute impulse type requiring no oiling (some "Standard" clocks now in satisfactory operation with over 50 years' constant service). We give below only a few styles more commonly used but we make scores of models to fit every condition, including large tower clocks.



Flush Clock

This clock has a very thin aluminum rim case projecting only ¾" from wall, and furnished in a polished or lacquered finish, with satin aluminum dial.

No. FMT-10	10"	No. FMT-14	14"
No. FMT-12	12"	No. FMT-16	16"



Square Wood Case

These are for surface mounting and are made of birch or oak with hinged fronts, and finished as directed.

No. S-8	8"	No. S-14	14"
No. S-10	10"	No. S-16	16"
No. S-12	12"	No. S-18	18"



Weatherproof Clock

No. C-S-15

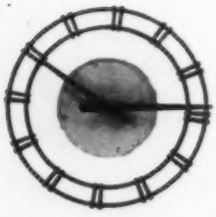
This is the most practical clock for outside use made for flush wall mounting, from 18" to 60". It is thoroughly weatherproofed and provided with heavy plate glass storm front, white vitrolite dial with etched numerals, and the case can be furnished with or without lamps for illumination.



Double Dial Bracket Clock

Made for either side wall mounting as illustrated or ceiling mounting. The clock cases are spun aluminum mounted on wood brackets as shown, and all being regularly finished in a medium brown tone lacquer or as directed.

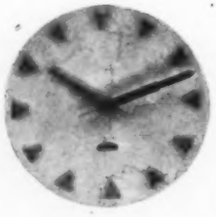
No. 506	12"	No. 508	16"
No. 507	14"	No. 509	18"



Skeleton Dial Clock

No. 1771

Skeleton dials are made with plain markers as shown, Roman numerals or specially designed markers as desired. They are of bronze and made in sizes from 12" to 60".



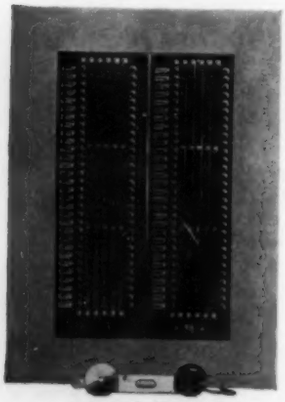
Marble Dial Clock

No. 1770

These clocks are made special of different kinds of marble, numerals, markers, etc., and in sizes from 10" up to 60", all to meet architects' requirements.

"STANDARD" SCHOOL TELEPHONES

The "Standard" telephone system is about the simplest and most efficient for schools. It utilizes the program bell control board as a central telephone station by adding a master telephone instrument, relay, buzzer, switch, etc.



Central Station

A filtered type telephone rectifier is furnished for the talking circuit.

This system is selective ringing and common talking. The buzzers in the class rooms are used as the telephone signals by giving them a couple of short rings from the central station to differentiate between telephone and program.

Any class room can call any other, through the central station only, thus giving complete supervision by the "office" over the entire system. This system has been commonly used in schools throughout the country for 25 years with great success. Due to its simplicity, maintenance cost is practically nil.



Wall Type

Telephone Instruments

These are supplied in different types as required, such as the flush wall, cradle desk type (both as illustrated), surface wall type, hand microphone, etc.

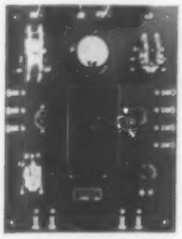


Desk Type

"STANDARD" FIRE ALARM SYSTEMS

Type MC Closed Circuit Fire Alarm System

This is a supervised, closed circuit, master code system, comprising a control panel, No. 451 break glass stations and single stroke gongs or horns. It operates from 24 V battery or 115 V AC or DC.



When a station glass is broken the signals sound a code of 2-3 for 4 rounds, then stop and an emergency bell on panel rings until the station has been restored to normal. In case of an open circuit in the system the emergency bell rings. A switch and pilot lamp are provided to silence the emergency bell until trouble is corrected.

Wiring—All stations in multiple on one continuous circuit with 2 wires brought back to panel from farthest station. All signals in series with up to 10 on a circuit for 115 V and up to 5 for 24 V.



Cabinet—Steel, for surface or flush mounting, 18" wide, 22" high, 7½" deep.

No. 451 Break Glass Station

Fire Alarm Signals



Gong 8" and 10"



Horn

Fire Alarm Signals are usually 8" or 10" under dome single stroke gongs or single projector type vibrating horns as shown above; double projector type horns, however, are furnished when required.

Type BC Closed Circuit, Coded Box System

This is a supervised system using control panel, coded boxes, gongs or horns and operating from 24 V battery or 115 V AC or DC.



No. B.C. 355H Box

Fire Boxes are made in the open door type (BC-150) or break glass, open door type (BC-355H) for surface or semi-flush mounting. They have special keys for drill and test purposes.

When a station is operated 4 station code rounds are sounded on the signals, then the emergency bell on panel rings until silenced by switch with pilot light until station is restored to normal.

Wiring—All stations in series on one 2-wire circuit. All signals in series with up to 10 on a circuit for 115 V and up to 5 for 24 V.

Type 450 Open Circuit Master Code System

This is similar to the MC closed circuit except without electrical supervision. It is simple yet reliable and used successfully in thousands of schools. The system comprises a No. 450 master code box, No. 451 break glass stations (wired in multiple) and single stroke or vibrating gongs or horns (wired in multiple). It operates from 24 V DC or 115 V AC or DC.

Type NC-OC Non-Code General Alarm System

This employs non-code stations (No. 451) with non-contact AC vibrating bells or horns. When station is operated signals ring continuously. Can be furnished with electrical supervision if desired.

"STANDARD" LABORATORY AND ELECTRIC SHOP EQUIPMENT

The uses for this equipment may be generally classified as follows:

A—High, Vocational, Trade and Technical Schools
- Physics and Chemistry Laboratories
- Electric Shops

B—Colleges and Universities
- Physics
- Chemistry
- Chemical Engineering
- Physiology
- Pharmacology
- Biology
- Psychology
- Research
- Electrical Engineering
- Shops

In general this equipment is for furnishing and distributing different voltages, AC and DC, and other electrical services to students' and instructors' tables, lecture rooms, etc., as required for operation of electrical equipment, and also for teaching electricity in its various phases.

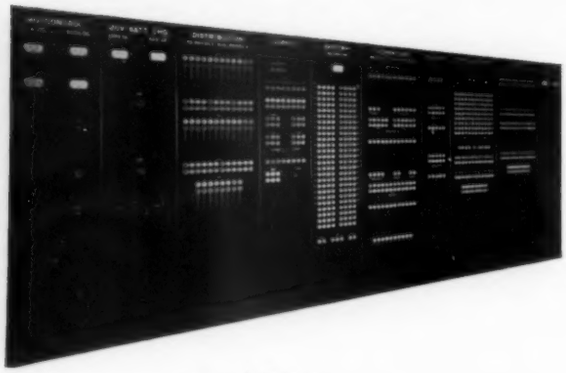
Some of the items designed, manufactured and furnished by this company are listed below:

- Main Control Board
- Distribution Panels
- Bench and Wall Service Units
- Special Test Panels
- Demonstration Type Transformers
- Precision Timers
- Impulse Machines
- Motor Generators of Various Types
- MG Control Panels
- Storage Batteries
- Battery Charging Equipment
- And many other items

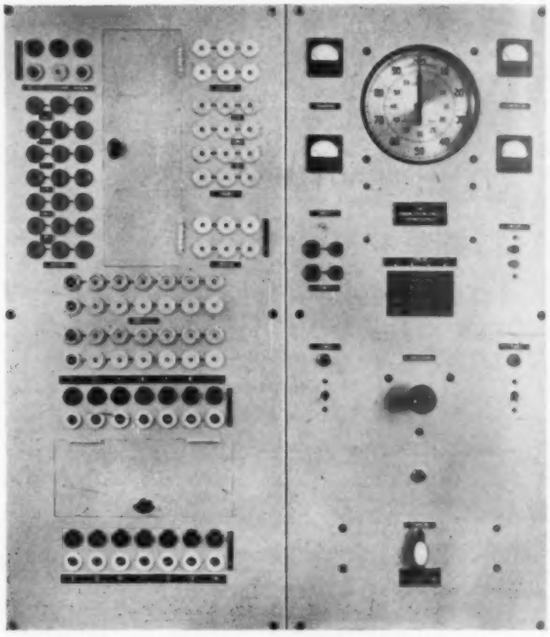
The requirements of laboratories and electric shops needing this type of equipment are special and differ widely with each job, due chiefly to the courses taught, size of classes, physical layout of building, individual ideas of instructors, etc. For this reason this company has a force of field engineers, well trained through many years' experience in this particular line, who are ready to assist architects, engineers and other interested parties, in recommending equipment and layouts to meet individual needs.

This service is rendered cheerfully without any obligation whatsoever so please call on us for it, whether the job is a small or large one.

A Few Examples of "STANDARD" LABORATORY AND ELECTRIC SHOP EQUIPMENT



A Large
Main Control and Distribution
Board for a College Physics and Chemistry Building



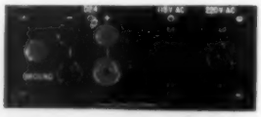
Control and Distribution Board for Physics and Chemistry Laboratory in High School



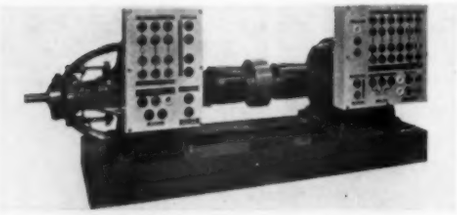
Electric Shop Switchboard for a Large High School



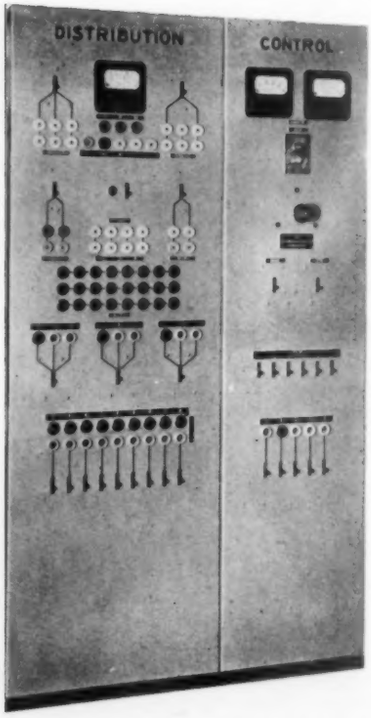
Service Unit for
Bench Mounting



Service Unit for Flush
Mounting in Bench or Wall



A Typical Electrical Shop Laboratory Type
Motor Generator with Terminal Panels, to Give
Different Motor and Generator Characteristics



Electric Shop Switchboard for Small
High School

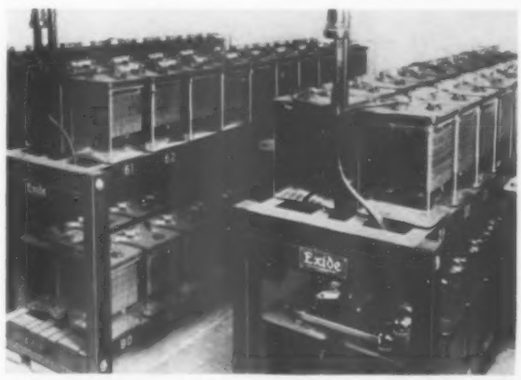
THE ELECTRIC STORAGE BATTERY COMPANY

World's Largest Manufacturers of Storage Batteries for Every Purpose

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The Exide Battery in The Research Laboratory of Physics, Harvard University. It is used for general service

FOR LABORATORIES, FIRE ALARM, PROGRAM CLOCKS, AUTO-CALL AND INTERIOR TELEPHONES

Exide Batteries are extensively used in the laboratories of the nation's foremost scientists, industrial research engineers, schools and colleges. Their performance records are the best testimony that can be offered as to their merit for laboratory services.

The foremost characteristics of Exide Batteries are absolute dependability and sustained high voltage until end of discharge. The operation of Exide Batteries is flexible. Cell connections to the battery can be arranged so as to give any desired voltage, with a wide range in discharge rates available at that voltage. By assigning a group of cells of the battery to a definite experiment, a constant voltage is assured which is free from disturbance or interference by any outside influence.

Exide Batteries of the sealed glass jar type have been carefully designed and are carefully constructed for laboratory service. They assure exceptional long life in laboratory service. Many Exide Batteries in laboratory and industrial installations have been in constant use for 20 or more years.

Regardless of how limited your budget appropriation, an Exide Battery can be selected to meet your requirements. Moreover, the wide experience of Exide engineers and the services of our nation-wide Exide organization are at your disposal. Write to the nearest Exide office shown above for further information.

EXIDE EMERGENCY LIGHTING

Positive Protection Against Dangers of Sudden Lighting Failures

Either children or adults, you can never predict the actions of a crowd that is suddenly plunged into darkness. Danger is real. Danger of personal injury . . . danger to school property.

The utility companies take every precaution, but cannot control the effects of storms, floods, fires, and street accidents. Privately-owned plants, no matter how carefully planned and operated, may also have interruptions.

The only certain safeguard is an emergency lighting system that functions both instantly and automatically.

Electrical engineers agree that a storage battery, **properly maintained,** constitutes the most dependable source of emergency power. The new Exide Keepalite control equipment, which automatically keeps the battery properly maintained, represents the qualifications found desirable from the experience of more than 3000 installations in all kinds of buildings.

During an electric service interruption, Exide Keepalite furnishes the power from a dependable Exide Battery to the lights in auditoriums, gymnasiums, corridors exits, fire towers, stairways, engine rooms, locker rooms, swimming pools, dormitories, laboratories, etc.

Exide Batteries have been used in emergency service, by telephone, railroad and public utility companies since 1895.

The exceptionally long life obtained from Exide Batteries used with the Exide Keepalite System assures many years of dependable emergency lighting service.



A typical Exide-Keepalite System with a 60-cell Exide Battery and Control Unit. It operates instantly and automatically. The infrequent addition of water to the battery is the only maintenance required



Exide
BATTERIES

BENJAMIN ELECTRIC MFG. CO.

General Offices: Des Plaines (Chicago Suburb), Ill.

230–234 W. 17th Street, NEW YORK
20 N. Wacker Drive, CHICAGO
448 Bryant Street, SAN FRANCISCO

FLOODLIGHTING SPORTS AREAS

HUNDREDS OF SCHOOLS throughout the country have found the answers to their problems of stimulating attendance and increasing revenue from football in Benjamin floodlighting for night games.

Night football, just like softball and other floodlighted night sports, is assured of a greater following because it takes advantage of most peoples' leisure time and offers them entertainment at a time when they are free and seeking it.



mination for the football field of Loyola University in New Orleans, Louisiana, is provided by Benjamin "Play-Area" floodlights using 1500 watt lamps



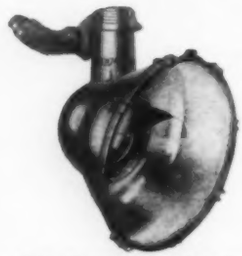
Installation of Benjamin Long Range "Alzo-Lite" floodlights using 1500 watt lamps at Bowman Gray Memorial Stadium, Winston-Salem, North Carolina



"PLAY-AREA"
For 750-1500 watt lamps



"ELLIPTO-LITE"
for 300-500, 750-1500 watt lamps



Long Range "ALZO-LITE"
For 750-1500 watt lamps



Medium Spread "ALZO-LITE"
For 750-1500 watt lamps

Benjamin "Play-Area" floodlights meet every requirement of football lighting by providing exceptionally high intensity illumination forward and toward the sides of the floodlighting unit. They combine in one unit a large open-type porcelain enameled steel reflector with an inner auxiliary reflector of processed oxidized aluminum which assists in building up illumination over distant areas.

Benjamin "Ellipto-Lite" floodlights are similar in general construction to "Play-Area" floodlights, but are provided with a slightly smaller porcelain enameled steel reflector. In light output they compare favorably with the "Play-Area" floodlights.

Benjamin Long-Range "Alzo-Lite" floodlights specifically meet the requirements for football field lighting from behind the stands when located 60 to 120 feet back from the sideline. An etched Alzak aluminum deflector redirects a portion of waste light downward to provide illumination in the stands.

Benjamin Medium-Spread "Alzo-Lite" floodlights meet the need for a unit with a light distribution between the wide spread characteristic of porcelain enamel diffusing floodlights, such as the "Play-Area" and "Ellipto-Lite," and the more concentrated distribution of the Long-Range "Alzo-Lite."

LIGHTING INTERIOR AREAS

Benjamin "Stream-Flo 40" fluorescent units are recommended for the lighting of class rooms and buildings devoted to engineering and vocational pursuits. They are also recommended for laboratories where no corrosive fumes, moisture or hazardous atmospheric conditions are present. "Stream-Flo 40" fluorescent units are ruggedly constructed for long dependable service, with housings of heavy gauge steel and closed-end steel porcelain enameled reflectors. Units are available for two or three 40-watt fluorescent lamps.

For laboratories where explosive hazards are present, a complete line of incandescent Explosion Proof and Dust Tight equipment is available; where moisture proof and non-combustible fumes are prevalent, "Vapolet" units meet requirements.

Soft evenly diffused illumination through a wide range of intensities is provided by Benjamin Glassteel Diffusers. They are recommended for effective, glareless illumination of gymnasiums, field houses, basketball courts, handball courts, etc. Steel wire guards are available for these units.

For lighting book stacks in the library or shelves and bins in the store room, the "Stock-Bin-Lite" is recommended. The "Stock-Bin-Lite" provides uniform illumination from top to bottom of shelves.

The services of Benjamin lighting specialists are available for recommendations on improvement of existing lighting, as well as for recommendations on new lighting.

Write for information on your specific lighting problem





General Chemistry Laboratory of Northwestern Technological Institute, Evanston, Illinois, effectively lighted by "Stream-Flo 40" units using two 40-watt fluorescent lamps



Illumination for Materials Testing Laboratory at Northwestern Technological Institute, Evanston, Illinois, provided by "Stream-Flo 40" units for two 40 watt fluorescent lamps



Gym and Auditorium of Penfield New York High School lighted with Benjamin Classteel Diffusers using 500 watt lamps

GRAYBAR ELECTRIC COMPANY, INC.

Executive Offices: Graybar Building, New York 17, N. Y.

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AN ALL-INCLUSIVE ELECTRICAL SUPPLY SERVICE FOR SCHOOLS AND UNIVERSITIES

Through its nation-wide network of warehouses and offices, GRAYBAR distributes the products of more than 200 of the nation's leading manufacturers of electrical equipment and supplies. Its services are based on 76 years of experience in the electrical field.

Experienced GRAYBAR representatives and field specialists can perform unusually useful functions for the school architect, the electrical contractor, and the buyer of electrical maintenance supplies – going far beyond mere "order-taking."



AID IN ELECTRICAL PLANNING

GRAYBAR is fully informed on modern equipment for school lighting, communication, signaling and alarm systems. Specialists familiar with school installations in other communities will advise on choice of equipment and planning of the system you desire.



SERVICE ON ESSENTIAL SUPPLIES

GRAYBAR representatives can help your staff meet difficulties in procuring the electrical products necessary to keep going. From their broad knowledge of electrical supply sources and equipment, they can almost always suggest alternates for unavailable items. 4615

PRODUCTS LIKE THESE COME FIRST *VIA GRAYBAR*



ALARM SYSTEMS • ANNUNCIATORS • APPLIANCES • AUDIOMETERS • BATTERIES • BELLS • BUZZERS • CABLE • CALL SYSTEMS • CIRCUIT BREAKERS • CLOCKS • COMMUNICATION • CONDUIT • CONTROLLERS • CORDS • DRY CELLS • FANS • FITTINGS • FIXTURES • FLOODLIGHTS FLUORESCENTS • FUSES • HEARING AIDS • HORNS • INSTRUMENTS • INTER-PHONES • JUNCTION BOXES • LAMPS • LUMINAIRES • METERS MOTORS • PLUGS • PANELBOARDS • OUTLETS • RANGES • RECEPTACLES • RECTIFIERS • REFLECTORS • SIGHTMETERS • SIGNALING • SIRENS SOCKETS • SOUND SYSTEMS • STREET LIGHTS • SWITCHES • TAPE • TELEPHONES • TESTERS • TRANSFORMERS • TOOLS • VOLTMETERS • WIRE

CORNING GLASS WORKS

Corning, N. Y.

FOR THE BEST IN LIGHTING
SPECIFY
CORNING ENGINEERED LIGHTINGWARE

In preparing a layout for a lighting installation it is important to consider recommended illumination levels, the most efficient types of fixtures for the particular application, unit spacing, brightness and brightness contrasts.

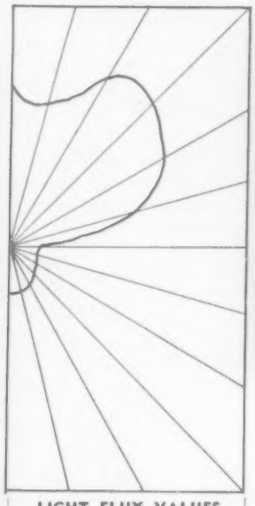
Semi-indirect luminaires (delivering 60%-90% of the light fixture output upward) are recommended for use in general offices, lecture halls, conference rooms and classrooms. For work requiring higher levels of illumination, such as drafting, designing, bookkeeping, transcribing, etc., semi-indirect luminaires should be used with supplemental lighting on the working surface. If a fluorescent installation is desired, continuous rows of flush mounted lens panels may be used throughout to obtain these higher levels.

General distribution luminaires (delivering 40%-60% of the light fixture output upward) are recommended for use in passageways, locker rooms, washrooms, and other service areas. If fluorescent lighting is preferred, open end diffusing shields with end caps or bent Alba-lite panels may be effectively used.

For specifically directed illumination, such as map, picture and blackboard wall lighting or localized high lighting for exhibits and displays, Lenslites (lenses designed on the Fresnel principle) are recommended.

SEMI-INDIRECT LUMINAIRES



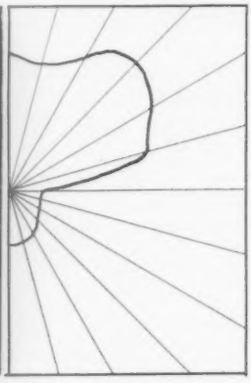


LIGHT FLUX VALUES		
Zone, Deg.	Luminaire Lumens	Percent of Total (Bare Lamp) Lumens
0-180	5008	87*
90-180	4040	70
0-90	968	17
0-60	544	9.5

* Fixture efficiency

"THE HALLSTADT", Galax brand globe, is designed to utilize most effectively the upward component of light reflected from the dense white lower portion of the globe. These globes are available in 14" to 18" diameters in 6" fitter sizes, accommodating 200 watt to 500 watt lamps.





LIGHT FLUX VALUES			LIGHT FLUX VALUES		
Zone, Deg.	Luminaire Lumens	Percent of Total (Bare Lamp) Lumens	Zone, Deg.	Luminaire Lumens	Percent of Total (Bare Lamp) Lumens
0-180	4879	84.5*	0-90	1077	18.5
90-180	3802	66	0-60	601	10.5

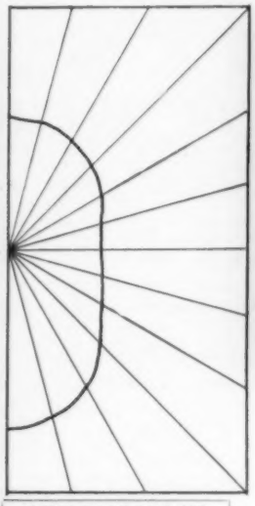
* Fixture efficiency

"THE CAVALIER" is an outstanding Galax brand semi-indirect lighting globe. Modern in design and exceptionally efficient, "The Cavalier" possesses the more desirable lighting characteristics for classroom and office lighting. Available in sizes of 14" to 18" diameters, in 6" fitter sizes, they will accommodate 200 watt to 500 watt lamps.

GALAX BRAND enclosing globes are of a uni-layer, physically homogeneous glass, treated in such a manner that the bottom of the globe is of a dense white, highly reflecting character causing a major portion of the light emitted by the enclosing lamp to be reflected upward. The upper portion of the globe is slightly diffusing, and permits a large percentage of the upward directed light to be transmitted. Inside frosted lamps are recommended for use with Galax brand enclosing globes.

GENERAL DIFFUSE LUMINAIRES



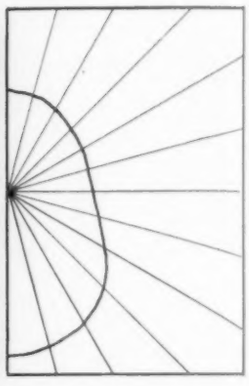


LIGHT FLUX VALUES		
Zone, Deg.	Luminaire Lumens	Percent of Total (Bare Lamp) Lumens
0-180	3088	85*
90-180	1469	40.5
0-90	1619	44.5
0-60	955	26

* Fixture efficiency

"THE ORION", popular and efficient Monax brand enclosing globe, is designed to conform with modern lighting practice. Shoulder construction of the globe permits ready suspension of a louvre when desired. These are available in a 9⅜" diameter, 4" fitter size to accommodate a 75 watt lamp, or in 12⅜" to 18⅜" diameters in the 6" fitter size for 100 watt to 300 watt lamps.





LIGHT FLUX VALUES		
Zone, Deg.	Luminaire Lumens	Percent of Total (Bare Lamp) Lumens
0-180	2840	83.5*
90-180	1211	35.5

LIGHT FLUX VALUES		
Zone, Deg.	Luminaire Lumens	Percent of Total (Bare Lamp) Lumens
0-90	1629	48
0-60	968	28.5

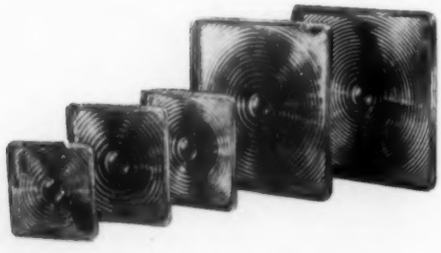
* Fixture efficiency

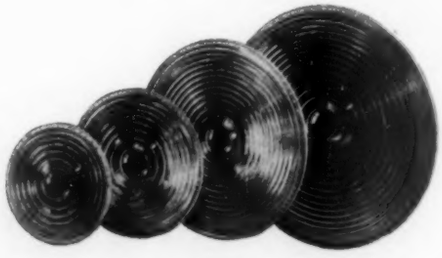
"THE SEVILLE", a Monax brand enclosing globe, is economical and efficient for all types of general diffuse illumination. Because of its well planned design and light distribution characteristics, it has been generally accepted as a standard in the illumination field. In the 4" fitter size, it is available in 8½" diameter for 60 watt lamps, and 10" diameter in the 75 watt lamps. The 6" fitter size globes range from 12" to 18" diameter for 100 watt to 300 watt lamps. A 20" diameter globe with an 8" fitter will accommodate a 500 watt lamp.

MONAX BRAND enclosing globes are of a highly diffusing white glass of homogeneous texture throughout. These globes are recommended for general diffuse lighting where high efficiency is required.

CORNING DOES NOT MAKE OR SELL LIGHTING FIXTURES

LENSLITES





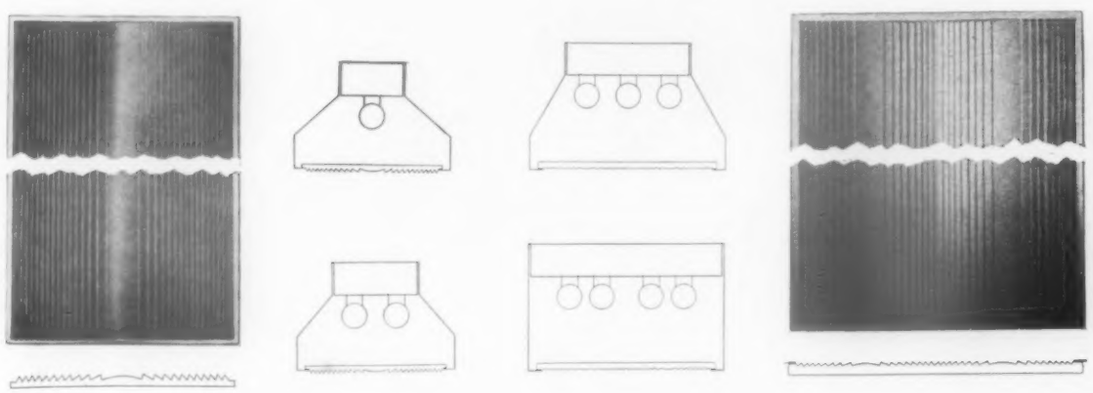
Lenslites, for use with incandescent lamps, are made of Corning brand (colorless crystal) or of Pyrex brand (borosilicate, heat-resistant) glass. They are a Fresnel-type flat lens having focal lengths to produce the desired light distribution. The prisms are arranged symmetrically and are large in size, numbering not more than six to the inch. Lenslites may be colouvered (the application of ceramic pigments to the inactive risers of the lens) to prevent high-angle glare.

The 6½", 8" and 12" square Lenslites are available in concentrating and wide-angle light distribution designs. The concentrating type is recommended where the light beam is confined to a maximum of 25° spread, whereas the wide-angle type is recommended for beam spreads ranging from 25° to 60°. The 6⅝", 8⅜", 11¼" and 13¾" diameter round Lenslites are available only in the wide-angle type.

FLEXIBILITY AND EFFICIENT ILLUMINATION WITH CORNING FLUR-O-GUIDE LENS PANELS

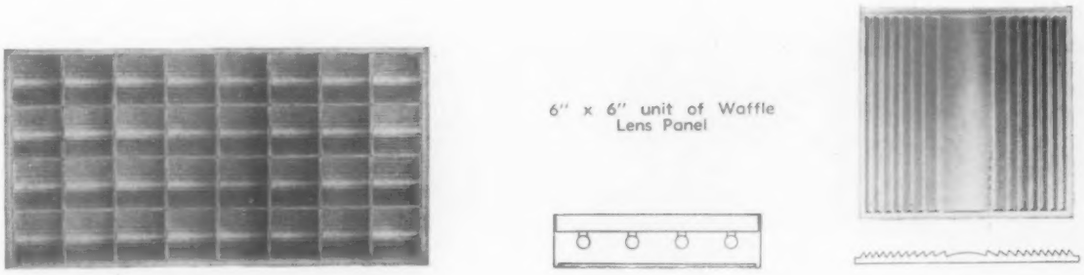
RANGE OF WIDTHS—Made in widths of 6", 8½" and 11", Corning Unilens and Twinlens Panels will accommodate 1, 2, 3 and 4 rows of line-light sources with the proper panel width. The Waffle Lens—up to 24" in width—will accommodate up to 4 rows of line-light sources.

RANGE OF LENGTHS—From 12" to 60" in length, Corning Lens Panels provide complete coverage of all sizes of standard and slimline fluorescent lamps up to 60" long with a one-piece lens panel. These longer panels result in reduced maintenance and uninterrupted prism design.



UNILENS—For one or two row line-light sources. Nominal widths 6", 8½" and 11". Nominal lengths 12" to 60".

TWINLENS—For multiple row line-light sources. Nominal width 11". Nominal lengths 12" to 24".



Nominal Widths 6" to 24"
Nominal Lengths 6" to 48"

WAFFLE LENS—For special architectural applications. This lens panel is made up of 32 six-inch square lenses and may be cut into multiples of 6" to the desired size.

SUGGESTED SPECIFICATIONS FOR LENS PANELS

The lens panel for the fluorescent lamp(s) shall be approximately (insert size) and shall be made of a colorless crystal glass. It shall be of the Fresnel type and shall have a focal length of (insert focal length). The prisms shall be arranged symmetrically on each side of the lens panel axis (or "axes" in the case of the Twinlens), and shall be large in size, numbering not more than seven to the inch. The rear surface of the panel shall be stippled or fine-lined.

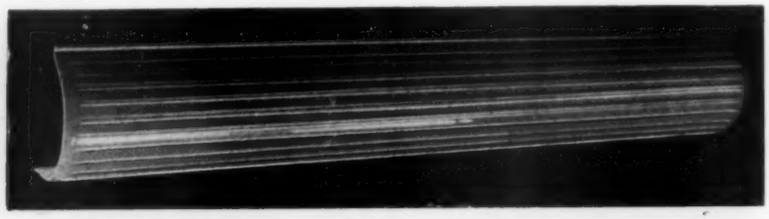
ALBA DIFFUSING LIGHTINGWARE

Alba-lite, flat or bent, and diffusing shields are made of "Alba", a homogeneous, translucent glass of medium diffusion and high transmission qualities. The diffusion of light rays over a wide area eliminates harsh, direct light and glare in the line of vision and results in low surface brightness.

The uniform quality of the glass and the smooth contours of the bent Alba-lite and shields present a pleasing modern appearance. Diffusing shields will accommodate up to four fluorescent lamps; Alba-lite panels are bent to fixture specifications to accommodate the desired number of lamps.



ALBA-LITE is a completely new lighting glassware, made of "Alba", in sheet form. It is available flat or bent, straight-edged or flanged, plain or patterned, annealed or tempered, in ⅛" or 7/32" nominal thickness. Because only flat glass is stocked, numerous design possibilities are opened up. Alba-lite is sold only to lighting fixture manufacturers.



OPEN END SHIELDS—For one to four fluorescent lamps, "Alba" diffusing shields provide an attractive diffusing system for installations of any size. Open ends permit them to be interconnected in continuous rows of any length.

Corning's Engineered Lightingware Service

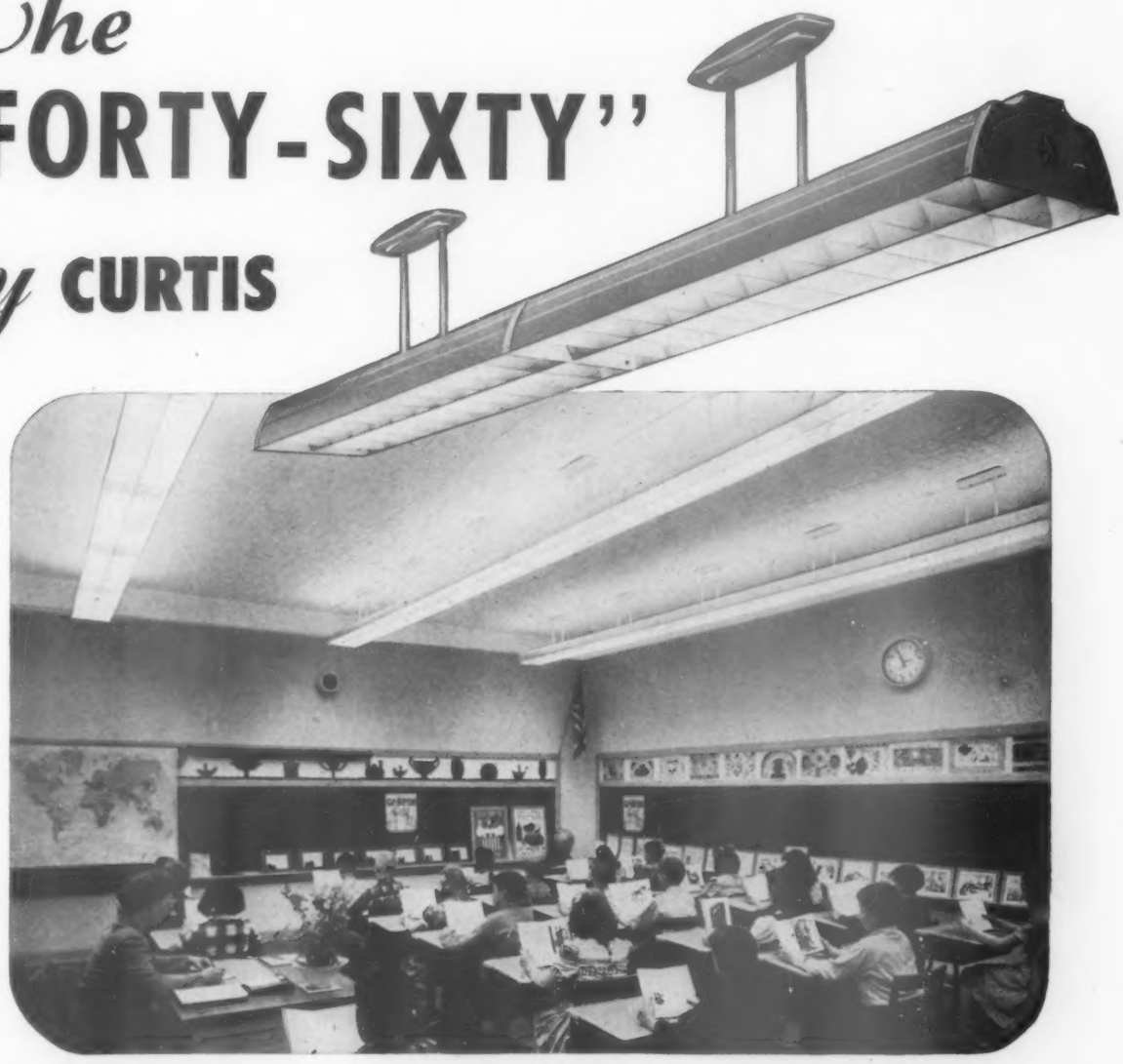
Corning Research and Development have produced a complete line of scientifically designed lighting glassware to meet the exacting needs of the architect, illuminating engineer and fixture designer. Backed by years of experience in illuminating engineering, Corning employs every technical and scientific advancement in the continuous process of developing finer illuminating glassware. Corning engineers will be glad to work with you on the solution of your lighting glassware problems for all types of installations.

LIGHTING SALES DEPARTMENT
CORNING GLASS WORKS, CORNING, N. Y.

CURTIS LIGHTING, INC.

6135 West 65th Street, Chicago 38, Ill.

The "FORTY-SIXTY" *by* CURTIS



MODERN LIGHTING FOR TODAY'S CLASSROOMS

The objective of modern schoolroom lighting is to create "seeing conditions" which are considerate of the eyes of the students. High brightness of the illuminating unit itself, does not necessarily provide adequate light on the working surface . . . more often it creates harmful glare which fatigues young eyes.

The Curtis "Forty-Sixty" is designed to direct 40% of its light upward and 60% downward. This feature coupled with a cleverly designed louver, shields the lamp from all practical angles of vision, thus giving pleasing room illumination and concentrated light where it is wanted.

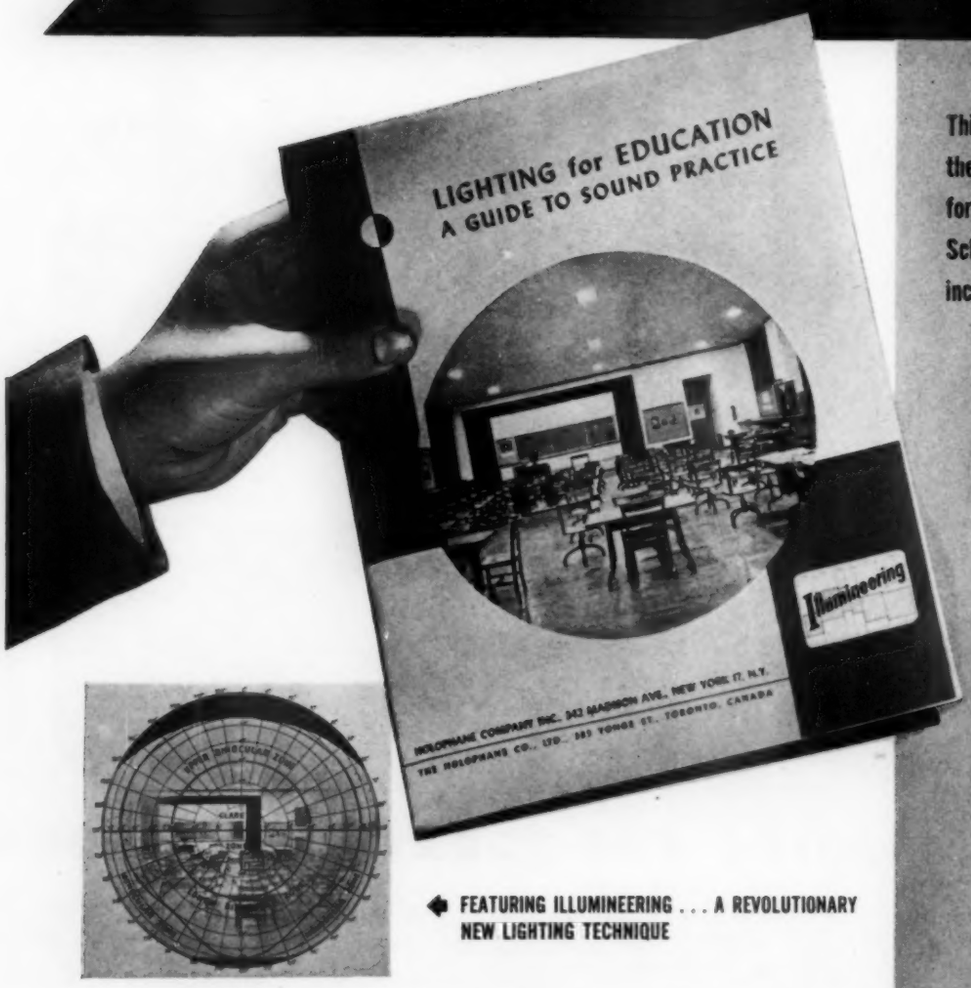
The Curtis "Forty-Sixty" is made of Alzak Aluminum and has no horizontal reflecting or diffusing surfaces to collect dust. Maintenance is at a minimum and long serviceable life is assured through Curtis craftsmanship and design. This unit can be individually mounted or can be installed in continuous runs. It uses two 40-watt fluorescent lamps.

Consult your usual source of electrical supply for further details and extra advantages of this unit, or write us direct

HOLOPHANE COMPANY, INC.

342 Madison Avenue
New York City

Just off Press: HOLOPHANE'S ANALYSIS OF SCHOOL LIGHTING



◆ FEATURING ILLUMINEERING . . . A REVOLUTIONARY NEW LIGHTING TECHNIQUE

This Book Provides the newest methods for any phase of School Lighting including:

Classrooms,
Drafting Rooms,
Art Rooms,
Blackboards,
Auditoriums,
Study Halls,
Lecture Rooms,
Reading Rooms,
Library Stacks,
Laboratories,
Shops,
Dining Rooms,
Kitchens,
Cafeterias,
Traffic Areas,
Medical Rooms,
General Offices,
Gymnasiums,
Outdoor Areas

MAKE PLANS NOW to bring the lighting in your school up-to-date . . . Your overall building expansion program may be set for some future date. Yet, you can take immediate measures to improve conditions in your present location by advancing the efficiency of your lighting equipment. For more than two generations, Holophane engineers have been recognized as authorities in school lighting. They present in this comprehensive book, methods of achieving effective economical lighting for every area of the modern school. This book is available without charge. Send for it immediately.

Consult Holophane Engineers About ILLUMINEERING



In-Bilt Controlenses in an auditorium



Classroom showing blackboard lighting

PLANNED LIGHTING FOR EVERY SCHOOL NEED

For every area in the school, there is a Holophane lighting unit specifically designed to provide the most adaptable illumination for the purpose.

Holophane Planned Lighting is effective, efficient, and economical. Each specific can be depended on to produce the greatest amount of useful lighting. There is no permanent depreciation of the prismatic glass light controlling surface, and temporary depreciation is at a minimum.



Classroom with luminous indirect luminaires



Gymnasium with Hibay reflectors



Architectural lighting outdoors



Lobay reflectors in shop

HOLOPHANE COMPANY, INC.... *Lighting Authorities Since 1898*

342 MADISON AVENUE, NEW YORK 17 • Holophane Co., Ltd., 385 Yonge St., Toronto, Can.

THE F. W. WAKEFIELD BRASS COMPANY

Yearwood Park
Vermilion, Ohio

Over 35 Years in the Manufacture of Lighting Equipment

DISTRIBUTORS IN 108 CITIES

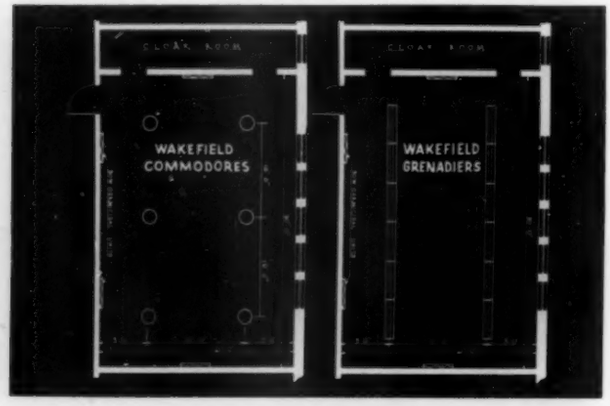
Tomorrow—
what type of lighting for your schools?

Practically every school administrator recognizes the need for better lighting in classrooms. You appreciate the possibilities which it offers for eyesight protection, for modernization in classroom appearance and for easier teaching. You realize the benefits it can bring to pupils in the "inner row" and the way its added cheerfulness promotes better citizenship. But having decided that you want these benefits, you are still faced with this question:

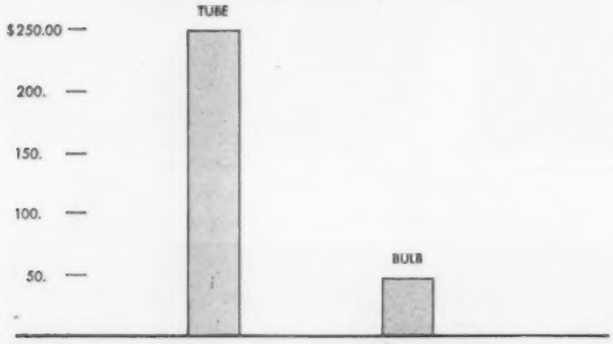
BULBS or TUBES?

Here are some cost figures that may help you decide. They are based on these two lighting layouts for standard classrooms. The BULB layout calls for six 500-watt semi-indirect fixtures (Wakefield COMMODORES) on ten-foot spacing. This should provide the pupils with a maintained minimum illumination of 23 footcandles at desk level.

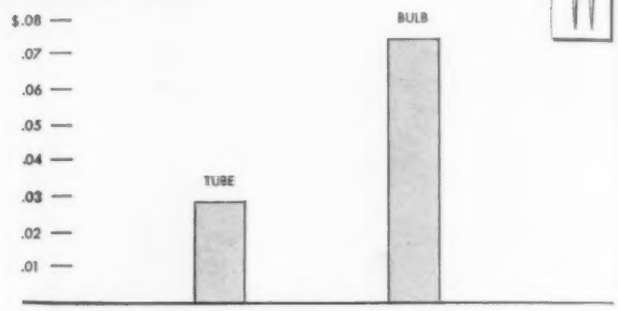
The fluorescent TUBE plan specifies two continuous rows of two 40-watt fixtures (Wakefield GRENADIERS), six fixtures in each row, with rows ten feet apart, to provide a maintained lighting level of 27 footcandles. (In practice this level proved higher . . . ran 35 to 41.)



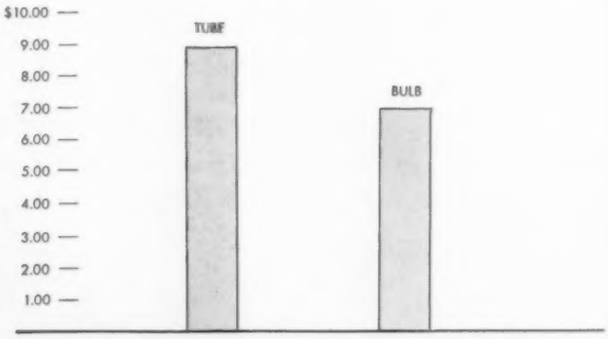
THESE CHARTS TELL THE STORY



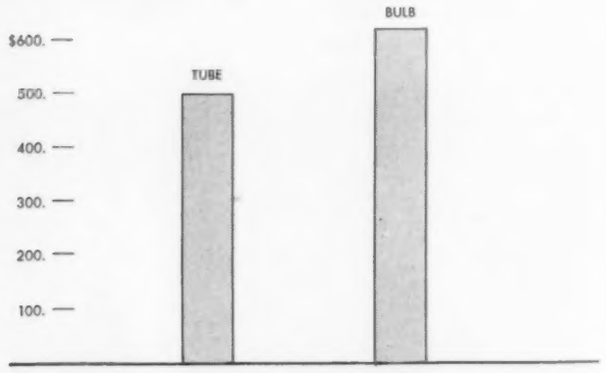
Comparative initial cost of equipment (with lamps)



Comparative operating cost at 2½c per kilowatt hour



Comparative lamp replacement cost per thousand hours burning



Comparative 10 year "cost of light" (includes fixtures, lamps and current at rate shown above)

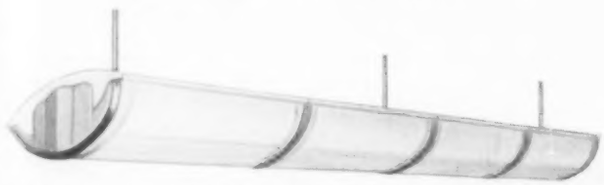
EITHER WAY YOU CHOOSE WAKEFIELD CAN HELP YOU

Whether circumstances and conditions in your school system dictate the choice of lighting equipment using incandescent bulbs or fluorescent tubes, Wakefield can provide you with top-notch lighting equipment. And Wakefield also offers you a brand-new method of using this equipment that will help young eyes and old . . . Over-ALL Lighting!

PLAN FOR NEW EYESIGHT PROTECTION WITH WAKEFIELD OVER-ALL LIGHTING

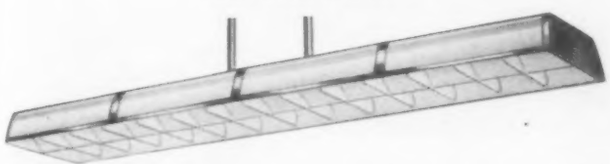
Specifically designed to guard against eyestrain, this new approach to schoolroom lighting by Wakefield . . . *Over-ALL Lighting* . . . provides smooth, pleasing, diffused light . . . *overall.* It supplies the kind of light that eyes need for easy seeing, the kind of light that makes for more attentive pupils, for easier teaching, for cheerful, fresh, up-to-date rooms. Pupils, parents, teachers will like it. Based on lighting results at the working plane, this new lighting system by Wakefield gives school executives a definite goal.

Brand new . . . the STAR



Modern in conception, this new indirect fluorescent lighting unit has a unique background. It was designed and re-designed by *users*—clinic-tested by lighting men all over the country to assure you the best possible equipment. Result: good lighting; simple, sturdy construction; easy maintenance. The STAR brings you all the advantages of fluorescent and of indirect light, plus proved Plaskon shielding. The brightness of the STAR blends into the ceiling to provide a "sky" of eye-easy, eye-pleasing light. Unusually simple to handle and clean; just slide out Plaskon reflector sections. No need to take unit apart. Used in continuous rows, this 2-lamp unit provides an ideal tool for lighting modern classrooms. However, for satisfactory lighting performance, the STAR should be used only in classrooms that have light ceilings and planned maintenance.

The GRENADIER





Wakefield GRENADIERS as installed in Chambers School, East Cleveland, Ohio

For modernizing older classrooms, particularly in dusty and dirty city neighborhoods, the Wakefield GRENADIER does an excellent job. It directs most of its light down on desktops. Yet its open top and plastic sides, *light* walls and ceilings for comfortable seeing conditions. The GRENADIER is especially adapted to end-to-end continuous row installations. It minimizes re-wiring since this unit provides its own wireway, and thus often permits existing outlets to handle the installation. Transversed louvers minimize lamp brightness. Reflectors face downward, gather less dust. Lamp replacements are easily made through the top.

The COMMODORE

This unit is the tested standard for incandescent lighting in many a school. It provides generous, high-quality illumination and provides it at low initial cost. It can modernize classrooms overnight. Provides diffused, pleasing, indirect light, to protect and help the eyes of pupil and teacher. The COMMODORE provides 86% of the light of the bare bulb according to Electrical Testing Laboratories, famous New York research and testing organization. More light than most indirect fixtures. And the COMMODORE is remarkably easy for the custodian to keep clean and efficient. Feather-light Plaskon shade is sturdy, easy to handle and clean.





Wakefield COMMODORES light a drafting room at Case School, Cleveland, Ohio

GET THE DETAILS ON WAKEFIELD Over-ALL LIGHTING

Your Wakefield distributor, or your lighting engineer or central station lighting man can give you specific information on Over-ALL Lighting by Wakefield. Meantime, you may want to send for this new free booklet—Over-ALL Lighting—which outlines the general principles of this important new lighting system.

GET THE LIGHT YOU PAY FOR

Are you throwing away dollars? Proper lighting maintenance —cleaning fixtures and walls, and re-lamping—can double or triple your light. Get the light you pay for—keep lighting equipment clean.

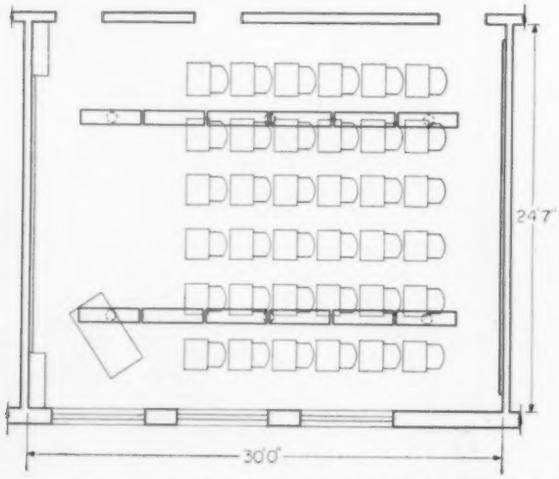
WESTINGHOUSE ELECTRIC CORPORATION

Plants in 25 Cities — Offices Everywhere

LIGHTING DIVISION — EDGEWATER PARK — CLEVELAND, OHIO



Twelve LW-160 fluorescent luminaires illuminate this classroom. The wall row of luminaires is used at all times when the class is in session, and both wall and window rows on dark and cloudy days.

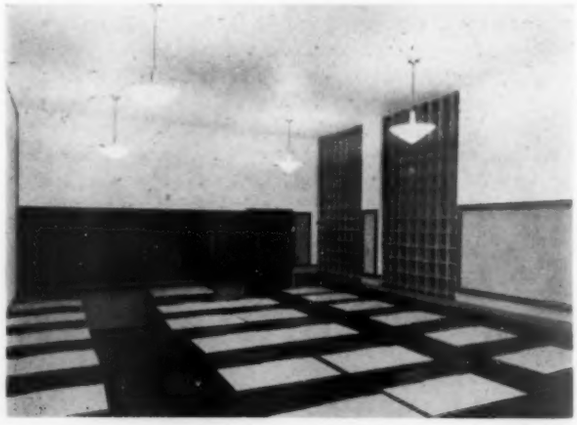


Plan of a classroom showing the location of six LW-160 luminaires per row.

Better "See-ability" for Classrooms

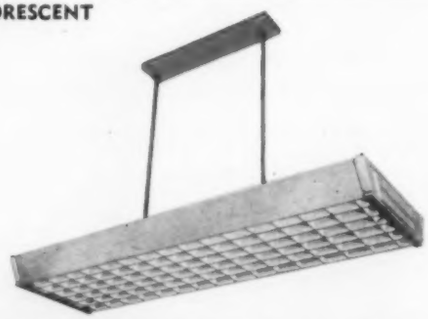
Artificial lighting for classrooms and other study rooms must supplement daylight so that high level, well diffused, glareless illumination is available at any hour of the day, any month of the year. While this need for artificial illumination has been generally recognized, it has been only recently recognized that artificial lighting should be used in some sections of the room even on normally bright days, because of the rapid decrease of daylight across the classroom away from the windows. Pupils sitting close to the windows receive as much as 20 times more light than those at the far side of the room away from the windows unless artificial lighting is employed.

Recommendations for school lighting by Westinghouse engineers go far beyond the equipment itself. They include recommended spacing of fixtures, color of walls and ceilings, and type of finish. Contact your local Westinghouse office or write to the Lighting Division, Westinghouse Electric Corporation, Cleveland, Ohio, for experienced assistance in your modernization of new construction planning.



Light desk tops, proper painting and six 500-watt Magnalux luminaires for illumination combine to give this classroom a pleasing appearance.

FLUORESCENT



LW-160 Fluorescent Luminaires, providing efficient semi-indirect lighting with four 40-watt lamps are designed for individual or continuous strip, ceiling or suspension mounting. Side panels are of ribbed diffusing glass, bottom panel can be either clear ribbed glass or metal louvres. Excellent for such school applications as classrooms, study halls or offices.

INCANDESCENT





Luminous indirect luminaires especially adapted for classrooms, study halls, offices, auditoriums and lunchrooms.

PL-500 Plastic Basin Indirect Luminaire—for 300-500 watt filament lamps.

Magnalux Glass Basin Indirect Luminaire—for 300-1000 watt filament lamps.

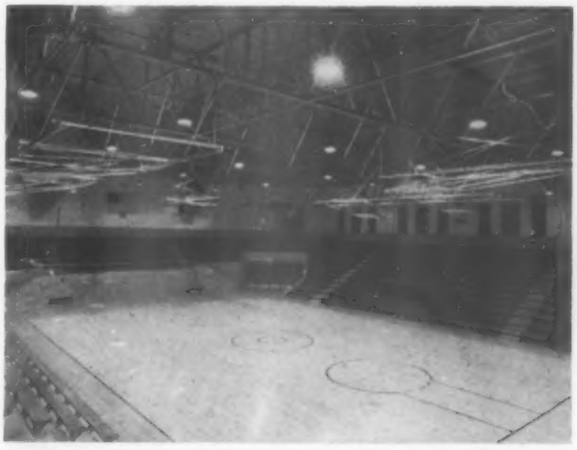
Better "See-ability" for Sports Facilities

In athletic areas detailed seeing is not usually required, but players and spectators must see accurately and quickly. Proper illumination, therefore, is necessary because speed of seeing is increased by higher levels of illumination.

Gymnasium equipment must be rugged to withstand severe abuse. Anything as fragile as a lamp must be fully protected to prevent breakage. Maximum visibility of a ball must be provided high above the floor as well as close to the floor. Walls, ceiling and trusses should have a high reflection factor to give maximum illumination and provide comfortable seeing conditions for both players and spectators.

For outdoor sports such as football, baseball, softball, or tennis, floodlighting installations must be designed to meet the type of application and physical surroundings. If areas are large, individual towers or poles spaced at regular intervals may be required to light it evenly; or adjacent buildings may be utilized as equipment locations.

Whatever your sports lighting problem, Westinghouse engineers will give practical assistance in solving them. Contact your local Westinghouse office or write to the Lighting Division, Westinghouse Electric Corporation, Cleveland, Ohio.



In gymnasium lighting it is important to provide good seeing conditions for both players and spectators. In this installation 300-500 watt Millite luminaires with wide distribution reflectors, using 500-watt PS-40 inside frosted filament lamps, were installed at a 22-foot mounting height.



VRC-18

The Westinghouse VRC-18 floodlight, designed for efficient sports field lighting. Features swing-over bracket for easy maintenance. Hinged heat-resisting glass lens keeps the reflecting surface clean and protects the lamp from breakage, or from bugs and driving rain and snow. Accommodates 750, 1000 or 1500-watt general service lamps.

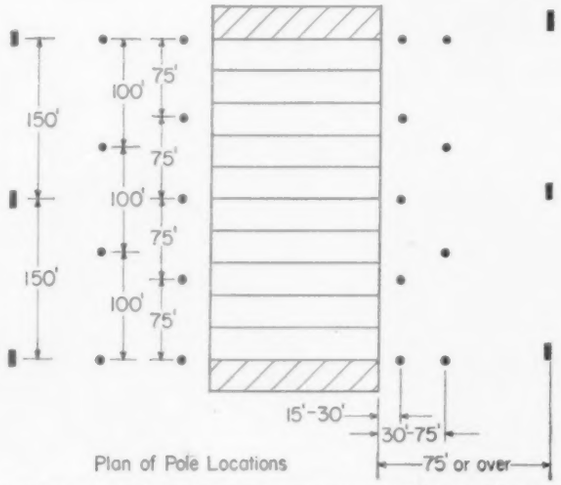


MILLITE

Wide distribution Millite provides direct lighting with incandescent or mercury lamps. This luminaire consists of a steel housing, Alzak Aluminum reflector, dust-tight hinged glass cover, and socket assembly. The glass lens is heat-tempered and will withstand severe impact. Lamp is protected from breakage and reflector is easy to clean. Millite is widely used for lighting school gymnasiums.



Westinghouse equipment is available for both indoor and outdoor school lighting. Here VRC-18 1500-watt floodlights illuminate the football field for night games.



National Electric Manufacturers' Association (NEMA) Standard Layout for Football Lighting.

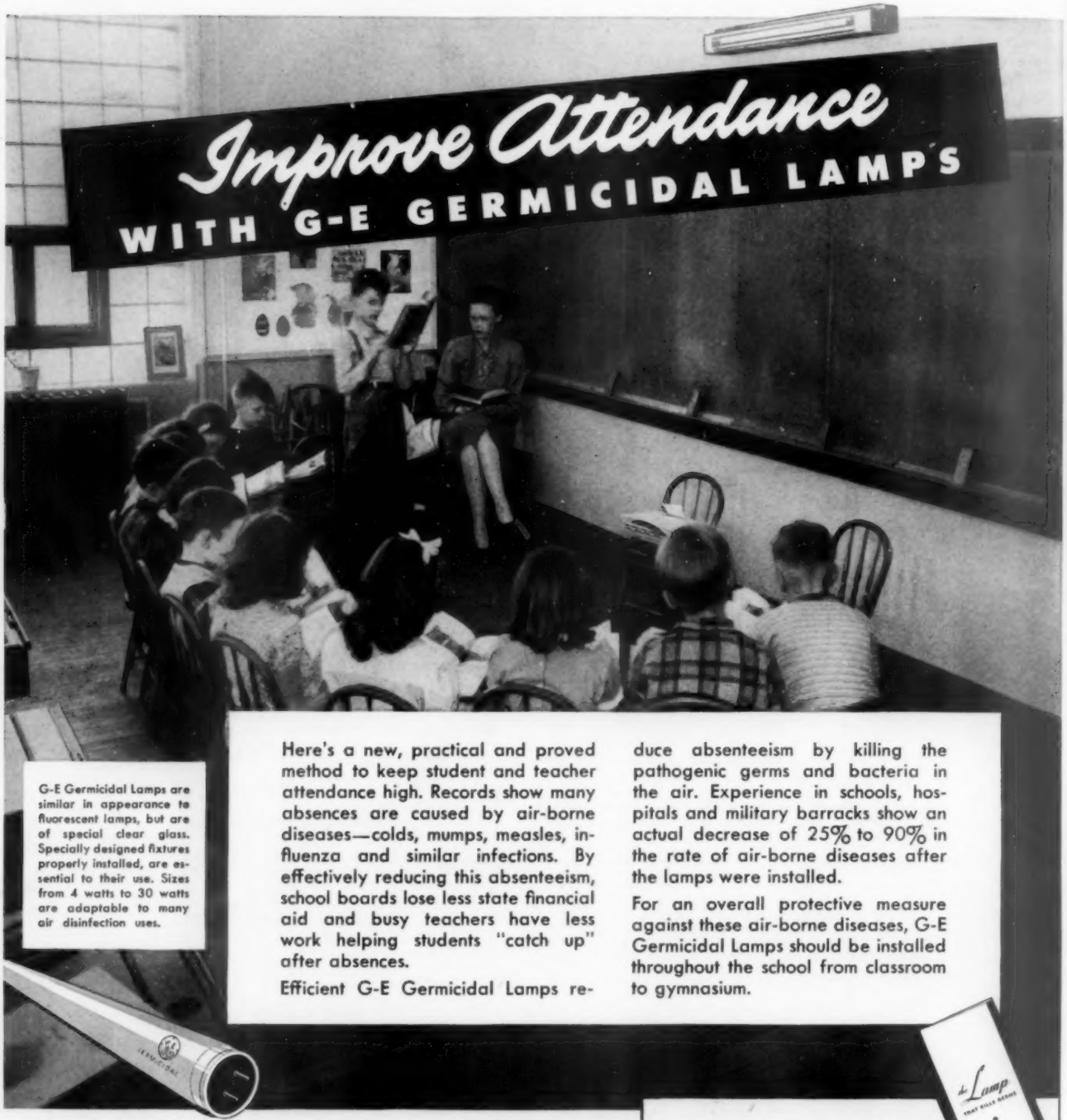
DISTANCE FROM EDGE OF FIELD	NO. OF POLES	1500-WATT FLOODLIGHTS		TOTAL LOAD IN KILOWATTS*
		UNITS PER POLE	TOTAL UNITS	
CLASS A INSTALLATION				
30' or under	10	12	120	208
30'-75'	8	16	128	222
75' or over	6	24	144	250
CLASS B INSTALLATION				
30' or under	10	8	80	139
30'-75'	8	12	96	167
75' or over	6	18	108	188
CLASS C INSTALLATION				
30' or under	10	6	60	104
30'-75'	8	9	72	125
75' or over	6	14	84	146
MINIMUM				
30' or under	10	4	40	70
30'-75'	8	6	48	84
75' or over	6	9	54	94

* 10% Over-Voltage

GENERAL ELECTRIC COMPANY

LAMP DEPARTMENT

Nela Park, Cleveland, Ohio



G-E Germicidal Lamps are similar in appearance to fluorescent lamps, but are of special clear glass. Specially designed fixtures properly installed, are essential to their use. Sizes from 4 watts to 30 watts are adaptable to many air disinfection uses.

Here's a new, practical and proved method to keep student and teacher attendance high. Records show many absences are caused by air-borne diseases—colds, mumps, measles, influenza and similar infections. By effectively reducing this absenteeism, school boards lose less state financial aid and busy teachers have less work helping students "catch up" after absences.

Efficient G-E Germicidal Lamps reduce absenteeism by killing the pathogenic germs and bacteria in the air. Experience in schools, hospitals and military barracks show an actual decrease of 25% to 90% in the rate of air-borne diseases after the lamps were installed.

For an overall protective measure against these air-borne diseases, G-E Germicidal Lamps should be installed throughout the school from classroom to gymnasium.

G·E LAMPS

GENERAL ELECTRIC

Many practical uses for G-E Germicidal Lamps are suggested in the illustrated booklet "The Lamp That Kills Germs". Write to General Electric, Nela Park, Dept. ASU, Cleveland 12, Ohio, for your free copy.

The EDWIN F. GUTH CO.

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FLUORESCENT — INCANDESCENT — GERMICIDAL LIGHTING

A GUTH LUMINAIRE FOR EVERY SCHOOL LIGHTING NEED!

Guth has the answers to School lighting problems. From small utility type fixtures to artful entrance standards, we offer a complete line of luminaires efficiently designed for Fluorescent or Incandescent light sources, also the new *Ultra-Violet* lamps for control of contagion.

Thru long years of experience in the Lighting Industry, Guth has pioneered and developed specialized fixtures to provide the high standards required for efficient, comfortable School Lighting. Our engineers will help you select the correct luminaires for your needs and give you constructive suggestions on your lighting problems.



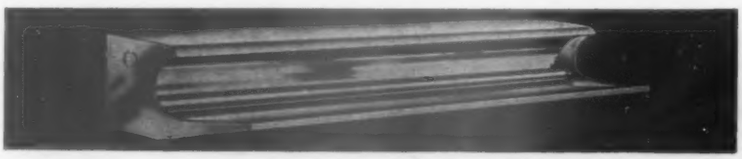
Guth "CADET" — Best Seeing Type



Guth "ZEPHYR"

FLUORESCENT—Guth Fluorescent Luminaires for Schools are of various types including glass-diffusing, lamp shielding (Egg-Crate types), totally-indirect, Troffers and exposed lamp types. Engineered Guth Fluorescent Lighting Systems economically provide easy-seeing illumination at desk level. Write for Catalog No. 44 for full information and complete engineering details.

INCANDESCENT—Guth Indirect Lighting provides complete concealment of light source. Illumination at desk level is uniform, shadowless and glareless. Guth Indirect Luminaires are available in various designs with efficient *Alzak* Aluminum reflectors which are guaranteed permanent. Guth Incandescents are also provided in Direct, Direct-Indirect and Semi-Indirect types. Write for Guth Catalog No. 41.



Guth "GERM-KILLING LIGHTS"

GERMICIDAL—Guth "Germ-Killing Lights" are for the new Germicidal lamps which kill air carried bacteria. "Germ-Killing Lights" are available in wall mounting brackets, ceiling mounting types, portable floor-standard models. Guth "Germ-Killing Lights" may also be had in combination with fluorescent lighting in shielded Guth Fluorescent Luminaires. Write for new Guth Ultra-Violet brochure.





EXIT and directional signs are available in practically unlimited variety of styles, wording and mountings. Write for Guth Catalog No. 41.



RECESSED LIGHTING — For auditorium, hall or classroom; for Incandescent or Fluorescent lamps. Write for full details.

GYMNASIUM REFLECTORS—Guth ALZAK Aluminum High-Bays for Incandescent or Mercury Vapor Lamps, are available in 3 reflector types. Write for Guth Catalog No. 44.



SPECIAL DESIGNS for lighting fixtures for school entrance, vestibule and entrance exterior will be furnished upon request. Write Guth Designing and Engineering Departments for designs and prices.

DEVRY CORPORATION

5 Time Winner "E" Flag

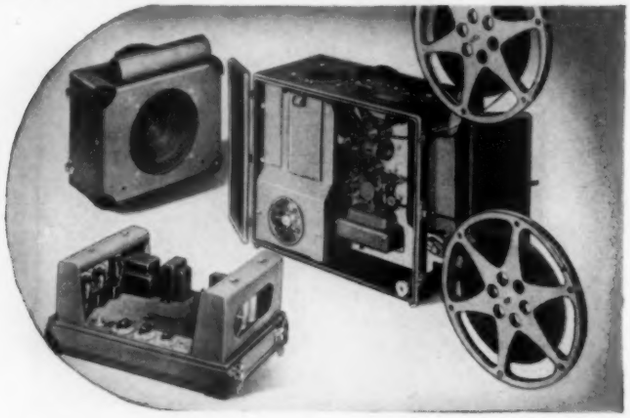
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NOW AVAILABLE DEVRY PROJECTED TEACHING AIDS EQUIPMENT



The New DeVry Professional Model RS-ND30 PORTABLE 16mm. SOUND-ON-FILM PROJECTOR

Compact . . . simplified . . . rugged . . . precision built like a fine watch, the new DeVry gives you a separate high powered 30 watt amplifier and full toned permanent magnet speaker to provide sound-on-film projection comparable to theatre quality. With brilliant 750 watt illumination and coated light optics, the new DeVry will perform with equal ease in the classroom, assembly hall or auditorium. See it! Hear it! Then you'll know why DeVry is your best buy!

TWO BALANCED LIGHTWEIGHT CASES

The new DeVry is so easy to set up, to transport, to use. The projector is in one compact case, the amplifier and speaker in the other.



THE NEW DEVRY GIVES YOU 3 MACHINES IN 1



Your new DeVry safely projects both 16mm. sound and silent films.



Your new DeVry shows both black and white and Kodachrome films without extra equipment.



Your DeVry has separately housed 30 watt amplifier and 12 inch permanent magnet speaker — affording a portable PUBLIC ADDRESS SYSTEM—indoors or out.



DEVRY TRIPLE PURPOSE SLIDE FILM PROJECTOR

USED 3 WAYS . . . (1) For Single Frame Slidefilm. (2) For Double Frame Slidefilm. (3) For 2"x2" (35mm.) Kodachrome or Black and White Slides. Built-in motor driven forced air cooling, plus heat filter, safeguards film or slides and permits the efficient use of a 300 watt lamp. Manumatic slide carrier holds 50 paper or 20 glass slides. Five inch F:3.5 lens. Simple to use.



MICROPHONES and ELECTRIC PHONO RECORD TURNTABLES

QUALITY MICROPHONES for efficient public address work. Hand or stand models. Furnished complete with shielded cable and heavy duty plugs. **TURNTABLE** operates at two speeds, 33⅓ rpm. for transcriptions and 78 rpm. for regular records. Takes records up to 16 inches in diameter—15 minutes playing time for one side. Superb tone arm, feather-touch needle pressure.



DEVRY 16mm. MOTION PICTURE CAMERAS

Anyone can take superb movies with this ultra precision camera. Holds FULL 100 feet of black and white or color film. Three speeds, 16, 24 and 64 frames per second. Equipped with fast COATED F:2.5 lens. Diecast aluminum housing, footage dial, eye level viewfinder, exposure chart and other exclusive features make this DeVry movie camera a top-notch value.



TEACH "KNOW-HOW" WITH "SHOW-HOW"

Through the Magic Power of

16mm. SOUND MOTION PICTURES

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Lists more than 1000 films available on rental basis or for outright purchase. Classroom teaching films, religious films and full length Hollywood film productions. Your free copy awaits you.

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Your school's up-to-date audio-visual program calls for the best in equipment and teaching films!



Today more and more schools are depending on Young America Films, Inc., for top quality audio - visual equipment and teaching films. The reason is simple. Young America offers a **complete** line of audio-visual equipment—16 mm. projectors, slidefilm, projectors, screens, lamps, microphones, and film storage and editing aids—as well as an ever expanding list of 16 mm. curriculum films, 35 mm. slidefilms and 2" x 2" slides. These films, with their accompanying teachers' guides—which include discussion outlines and supplementary projects—will greatly ease many of your teaching problems. Included in Young America Films projected program are films for every grade from kindergarten through high school in every basic subject—prepared or checked by leading educators in relation to actual curriculum needs.

In addition to Young America films and slidefilms now available for your school library, new curriculum and documentary films are being produced each month. For complete details on Young America films and equipment write for new 1946-1947 catalog.

THESE OUTSTANDING AUDIO-VISUAL EQUIPMENT LINES DISTRIBUTED BY YOUNG AMERICA FILMS, INC.

Every equipment line distributed by Young America Films is thoroughly tested in actual school operation before it is offered for sale. For complete details write for Young America Films 1946-1947 Catalog.

NATCO 16 mm. PROJECTORS

Professional type, for sound or silent film. Unusually easy to operate. No belts or reels to attach. No complex threading. Direct optical scanning system for clearest sound. Individual assembly and sub-assembly unit contruction simplifies servicing. Efficient cooling system and central lubrication. 20-watt amplifier unit. 2-inch F 1.6 coated surface projection lens.

ARGUS SLIDEFILM PROJECTORS

Best value in all-purpose 35 mm. projectors. Suitable for showing single or double frame slidefilms and 2" x 2" slides. All lenses coated, thus affording up to 16% better illumination. Simple change over from slide films to slides.

ALSO AVAILABLE THRU YOUNG AMERICA FILMS' DISTRIBUTORS—NEUMADE FILM EQUIPMENT—RADIANT SCREENS—RADIANT LAMPS—ASTATIC MICROPHONES.

4 Typical Young America films you'll want in your school film library

"WE, THE PEOPLES"—A provocative documentary film presenting the story of the United Nations Charter. For junior and senior high school. One reel (8 minutes). 16 mm. Sound-on-film. $30.

"SAFETY TO AND FROM SCHOOL"—When and where to cross a street is explained in simple dialogue. For primary grades (1, 2, 3). One reel (10 minutes). 16 mm. Sound-on-film. $30.

"WHAT IS FOUR"—Combination of action photography and animation to give children an understanding of the number "four" in concrete and abstract situations. For primary grades (1, 2, 3). 1½ reels (15 minutes). 16 mm. Sound-on-film. Black and white. $45. Color, $110. Part one available separately in black and white only. One reel (7 minutes). $30.

"OUR SHRINKING WORLD"—Study of the history of transportation and communication. For junior and senior high school. One reel (10 minutes). 16 mm. Sound-on-film. $30.

3 films typical of those selected by Young America Films for school distribution

"PLAY BALL, SON!"—An outstanding baseball training film for boys 11 to 15 introduced by Joe Cronin, manager of the Boston Red Sox. 2 reels (17 minutes). 16 mm. Sound-on-film. $100. 1½ reels (13 minutes). 16 mm. Silent. $50.

"FUNDAMENTALS OF TENNIS"—Don Budge explains and demonstrates correct tennis play. 2 reels (20 minutes). 16 mm. Sound-on-film. $60.

"THE HOUSE I LIVE IN"—Frank Sinatra stars in a powerful appeal for tolerance. Produced by Frank Ross and directed by Mervyn Leroy, this film offers a basic lesson in democracy. One reel (10 minutes). 16 mm. Sound-on-film. $27.50.

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During production, a constant check is kept by Curriculum Film's educational advisory staff. And, as a further check to insure full color film strips and motion pictures of true educational content, editing is done by our producers and our educational advisory staffs.

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An educational research and distribution service for independent producers of educational films.

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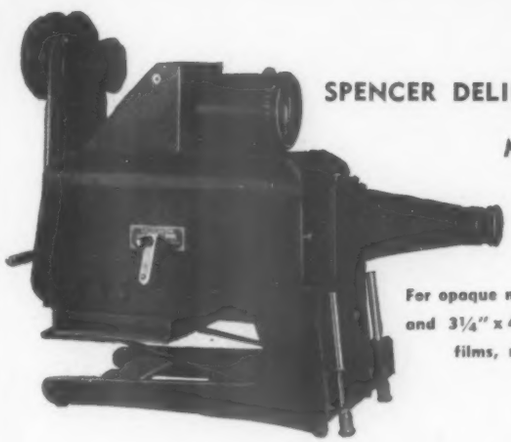
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SPENCER DELINEASCOPE

MODEL VA

For opaque material, 2" x 2" and 3¼" x 4" slides, slidefilms, microslides

This multi-purpose Delineascope makes it possible for the instructor to assemble many types of material and project them as a unit.

It will accommodate photographs, lantern slides, illustrations in books, pupils' work, and small objects of all kinds. The change from transparent to opaque material is made almost instantaneously by turning a handle.

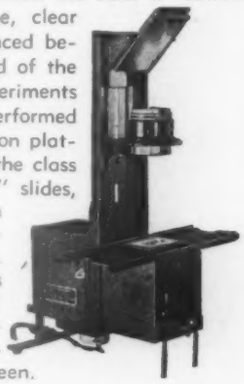
It has 500 watt illumination, rheostat-controlled cooling fan, and long-life aluminized mirror. Available equipment includes: elevating legs for centering the image, combined slidefilm and microslide attachment, convenient foot control that leaves both hands free to handle material.

MICROFILM READER



Microfilm copies of inaccessible books, precious documents, correspondence, formulas, contracts and other material can be read comfortably and conveniently with this low priced reader. The opaque screen, shadow box, and high quality, specially designed optical system make it possible to read for hours without ocular fatigue. Either 16 mm. or 35 mm. microfilm is projected at 15X. Roll film attachment accommodates film on 100 foot reels.

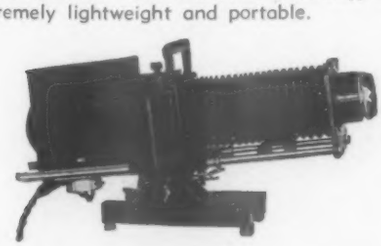
LECTURE TABLE DELINEASCOPE



The Spencer Model B is a unique projector which may be operated from the desk or lecture table, projecting a large, clear image onto a screen placed behind and above the head of the instructor. Many experiments in biology and physics, performed on its horizontal projection platform, may be shown to the class together with 3¼" x 4" slides, translucent specimens in petrie dishes, and silhouettes of small objects. The instrument occupies very little space (4⅞" x 11¼") and has an adjustable mirror for centering the picture on the screen.

LANTERN SLIDE DELINEASCOPE

Spencer Model D Delineascope is designed specifically for classroom projection of 3¼" x 4" lantern slides or 35 mm. single frame slidefilms. For teaching convenience it provides: non-heat conducting handle, elevating and tilting device, side aperture to illuminate manuscripts, well designed optical system to insure remarkably sharp, brilliant pictures. A slide carrier for 2" x 2" slides is available. The Model D is sturdy, extremely lightweight and portable.



COLOR SLIDE DELINEASCOPE

This Spencer Model GK with a 750 watt bulb surpasses the brilliance of most 1000 watt projectors. It provides safe, lifelike projection of 2" x 2" or 3¼" x 4" color slides. By means of an iris diaphragm, light intensity may be controlled for auditorium and large or small classroom use. Slide protection is assured by an ingenious cooling system, including a rheostat controlled motor driven fan and a heat filter. Interchangeable condensing systems concentrate the light properly for large or small size slides.



2" x 2" SLIDE DELINEASCOPE

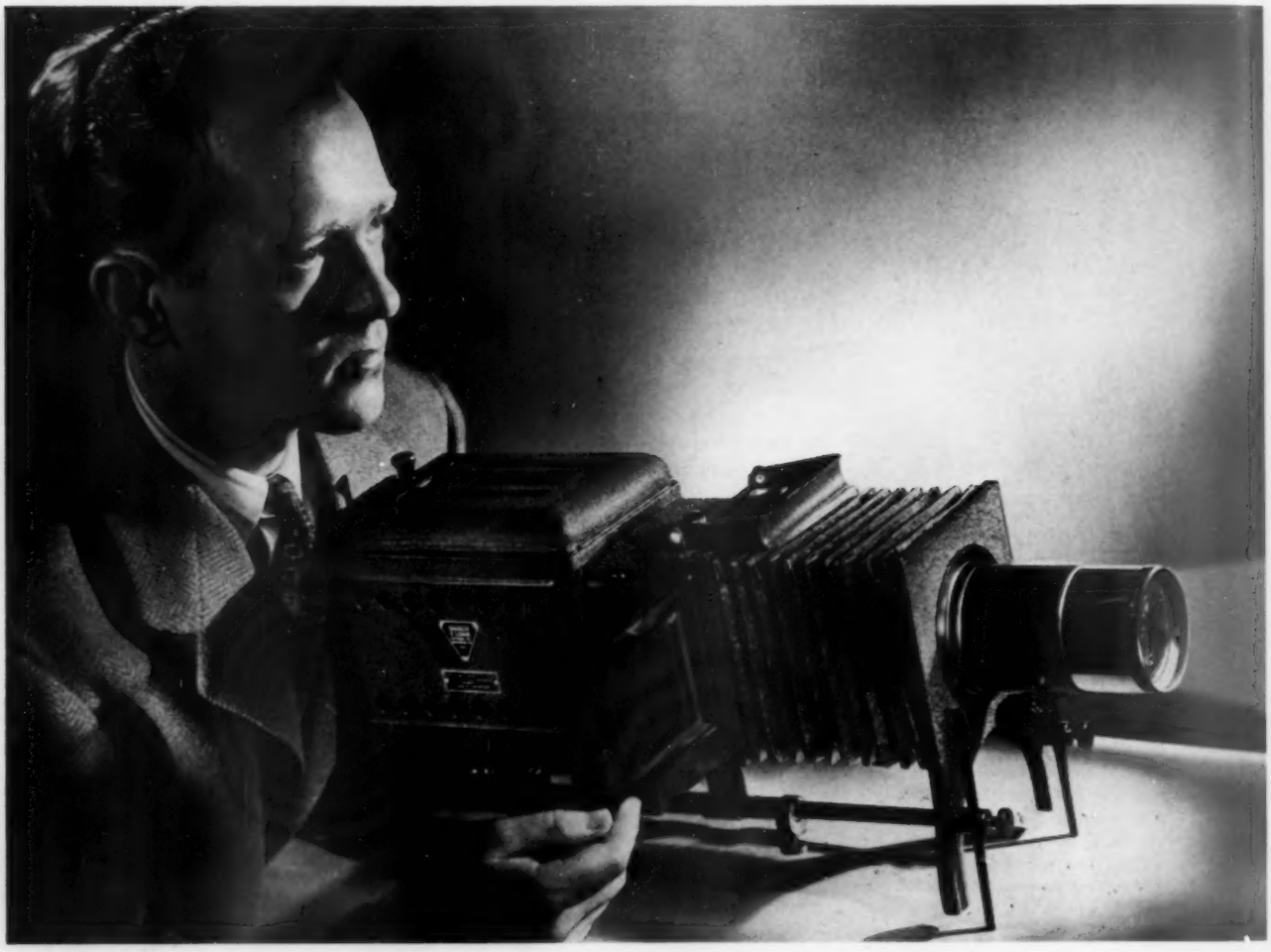
Many thousands of these neatly designed Model MK Delineascopes for small 2" x 2" color slides are in use today in schools and homes. The optical system produces unusually clear and brilliant images. The 5 inch focus lens has a speed of F:3.75. A large, well ventilated lamphouse keeps the equipment cool enough to handle at all times. There are four models: 100, 150, 200 and 300 watts. Parts are interchangeable.



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B BALOPTICON *—For Slides Only

This extremely popular model is inexpensive, sturdy in construction, compact, easily portable and highly efficient. Its optical system is of exceptionally high quality. It can be fitted with optical systems adapting it to a wide range of projection distances. Maximum illumination. Extremely simple to operate. Strip film, micro-projector and overhead projector attachments are available.

Model BDT is the same instrument as the B, but with a sturdy, tilting base, adjustable in two meridians. It permits leveling the Balopticon even when placed on an uneven surface. This mounting allows for changing the projection angle for screen at various heights.



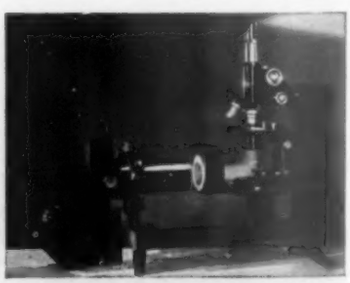
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B&L 2" X 2" SLIDE PROJECTOR

Manufactured to the high standards of performance that characterize all Bausch & Lomb projection equipment, the performance of the B&L 2" x 2" Slide Projector is characterized by brilliant, crisp, sharply defined screen images plus comfort, safety and convenience in operation. Shows black and white or color transparencies. An ideal instrument for projecting slides made by the instructor or by the students themselves.

This instrument is substantially made and is fitted with a high efficiency Bausch & Lomb optical system. This consists of a 150 watt, single contact base bulb with a silvered, concave reflector, a triple lens condenser, one lens of which is heat absorbing, and a five-inch f:3.8 B&L Cinephor Projection lens of the same type as used in professional motion picture projectors. Slide carrier permits use of cardboard, metal or glass mounted slides.

MODEL B MICRO-PROJECTOR



The Model B Micro-Projector fills teaching needs in many fields. Any department where a compound microscope is used, by the addition of this instrument, can enjoy the advantage of efficient and economical micro-projection.

Simply place the microscope on the stage of the projector in an upright position, apply the prism reflector cap to the microscope and focus the illuminator. Complete directions accompany each projector.

Investigate this instrument before completing your plans for science laboratory development.

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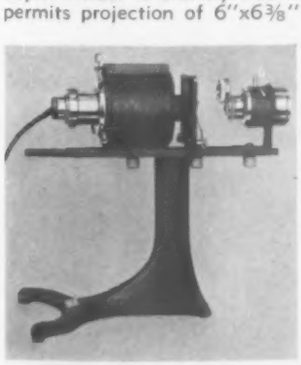
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LRM AND ERM BALOPTICONS *

The LRM Balopticon for lantern slides and opaque objects gives brilliantly sharp screen images under actual classroom conditions. An improved Built-In Blower-Cooling System efficiently safeguards objects being projected. The improved object holder is entirely free from interfering obstructions and permits projection of 6"x6⅜" areas of large maps, drawings or photographs. The door is arranged for convenience in placing solid objects in the projection area. The ERM Balopticon is similar, but equipped only for opaque projection.



TRIPLE-PURPOSE MICRO-PROJECTOR

Especially designed and priced for high schools, this extremely efficient unit serves three definite purposes: (1) projection of permanently mounted specimens on a screen from 4 to 15 feet away. (2) making drawings of microscopic fields. (3) projection of living specimens in liquids. Exceptionally sturdy in construction. Has both coarse and fine focusing adjustment. A two-power projection lens is included.



BALOPTICON TABLE

The B&L Balopticon Table provides a means of placing a Balopticon where it can be used to best advantage. It is portable (rollers on two front legs), and has a shelf underneath for slide boxes.

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SEND FOR CATALOGS

Catalog E-11 "Balopticons and Accessories," completely describes our line of Balopticons, many of which were omitted here due to lack of space. Micro-Projectors for school and college use are the subjects for Catalog E-20. For information on Bausch & Lomb Microscopes and Spectrographs see pages 476, 477 of this book.

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Educational, Professional, and Personal Motion Picture Equipment
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B&H Filmosound 179, new, cooler, simple to operate . . . 16mm. sound-on-film projector for classrooms and auditoriums.

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The world a generation ago was in many ways a simple world. Few people had even dreamed of radio, radar, television, airplanes . . . or movies. But the world before the child of today is vastly complicated.

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Bell & Howell motion picture equipment, precision-built by the makers of Hollywood's preferred studio equipment, is the finest made. And with it comes the services of B&H Visual Education Specialists, ready at any time to help you plan and operate an audio-visual program.

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B&H Filmotion Editor shows 16mm. pictures **in motion** on a miniature screen—an invaluable aid in editing school-made films.





B&H Filmoarc 16mm. arc-lamp sound-on-film projector—serves the largest audiences.

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B&H Filmosound Library, with convenient branches across the country offers for rent or purchase thousands of films . . . all school subjects, industry, farming, physical education, plus approved Hollywood entertainment features. Send for the educational film catalog.

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A Complete Line of New Improved Projection Screens



The Radiant "DL"—New, DeLuxe Portable Tripod Projection Screen

A new, improved Radiant Screen that sets up quickly, adjusts easily . . . has the finer "Hy-Flect" glass beaded screen surface which reflects more light, adds new brilliance to all picture projection.

The New "DL" embodies such advanced features as 1) *Feather-touch Friction Clutch* (U.S. Pat.) provides quick, smooth height adjustment; 2) *Automatic Leg Opening* (Pat. Pend.) opens the leg tripod quickly, locks it at any position; 3) *Built-in Shock Absorbers* (Pat. Pend.) add to screen life; 4) *New Screen Leveller* (Pat. Pend.) keeps screen level at all times; 5) *New Auto-Lock* (Pat. Pend.) converts screen from a square shape (for slides) to oblong shape (for movies).

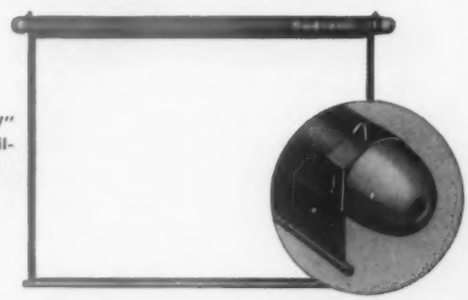
Among the other advanced features of this New Radiant "DL" are the *Shakeproof Safety Catch*, the *Automatic Leg Lock*, *Triangular Steel Tube Construction*, *Finger-Grip Carrying Handle*, *Rubber Ball Feet* and smart, two-tone finish.

Available in sizes from 30" x 40" to 70" x 70".

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THE RADIANT "AUTOMATIC"—electrically operated wall and ceiling screen is operated by a remote control electric motor. Fully concealed in a smooth streamlined screen housing, the screen stops at any desired position. Simple to operate, the "Automatic" is available in sizes up to 16 feet by 20 feet.

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New Radiant "W"—Wall and Ceiling Projection Screen

A double-duty projection screen which can be attached to either wall or ceiling. It unrolls smoothly and evenly with the aid of a spring roller device . . . the screen surface never becomes tangled or wrinkled. The sparkling "Hy-Flect" glass beaded screen fabric produces pictures which add new thrills to all picture projection.

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The Radiant "EC" — a new heavy-duty screen for large audiences

A large size spring-roller screen designed for auditoriums, clubs, institutions, churches, industrial plants and other large groups.

Torn fabric . . . a common annoyance in large roller screens of the past . . . has been eliminated. The new "EC" has both ends of the pull cord attached to the bottom roller. The result is an even pressure all along the bottom of the screen for *balanced* movement.

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Write today for illustrated Radiant folder giving complete details, specifications, sizes and prices on Radiant wall, ceiling and floor model projection screens.

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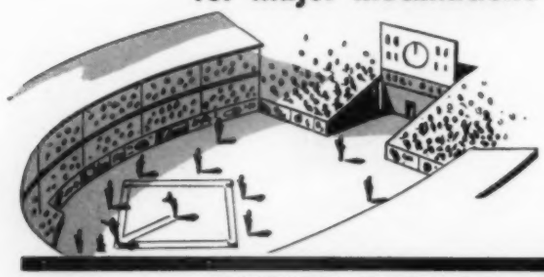
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Never before was it possible! If you are in any way concerned with the installation of loudspeaker equipment to be used in speech correction clinics, dramatic classes, music rooms or for any other purpose where exact sound reproduction is of supreme importance, you will want to investigate the Altec Lansing Duplex System. This is the same quality loudspeaker system that is used by major Hollywood studios to judge their own motion picture productions. Leading theatres throughout the country are now adopting Altec Lansing Speaker Systems in preparation for refinement and new developments in sound reproduction.

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for major installations



There are Altec Lansing high power, quality loudspeaker systems especially designed for use in school theatres, music rooms, drill and athletic fields and stadia. These systems are powered by amplifiers which range from 15 to 250 watts output.

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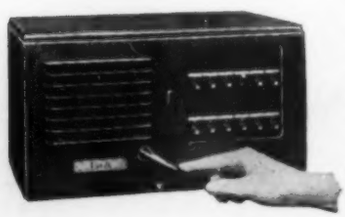
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Model 10212 Paging Control Unit with facilities to connect through an amplifier to 12 speaker lines.



Speaker-Microphone Station 5A-45B, with push-button annunciator signal.



Twelve Station Master Teletalk Unit Model 212 S for use in a system of twelve stations or less.

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Voice paging is the quiet, dignified way to reach the person wanted. With Teletalk Paging Systems it is possible to page a person at one station, or at all stations simultaneously. All systems carry volume control, all call and selective call features. Teletalk Speaker-Microphone units are available in models to meet volume required under varying conditions. Location, areas to be covered and noise level are determining factors.

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Teletalk Amplified Intercommunication Systems provide natural voice communication between class rooms, departments and buildings. Stations may be called individually or any selected group of stations may be called simultaneously. Total number of stations may be adjusted to meet the requirements of a specific situation.

Teletalk is easy to install . . . takes its power from the electric light circuit . . . inexpensive to operate and requires little service.

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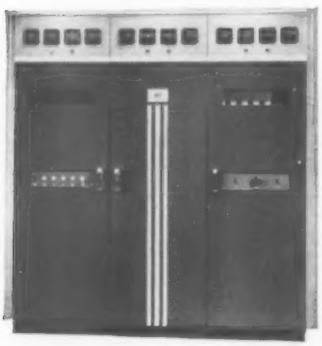
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RCA Victor Audio-Visual Equipment for Schools and Universities

RCA Wire Recorder, an electronic achievement

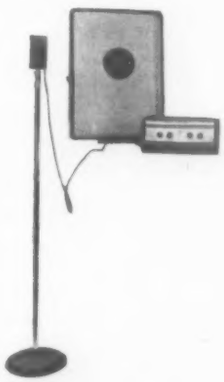
Now electronic recording of sound on a wire is made convenient, economical and practical. Through the research facilities of the RCA LABORATORIES, a replaceable RECORDING CARTRIDGE has been developed which requires no complicated threading. You do not touch the wire. No kinking or breaking. It's foolproof. Record a cartridge and save it for future reference, or make another recording on the same wire at once. Each cartridge can be recorded and played many hundreds of times without loss of fidelity. Ideal for language study and speech correction.





FM Broadcasting

As the world's largest manufacturer of Radio Broadcasting equipment, RCA provides a complete line of quality AM and FM Broadcast equipment for schools and universities. RCA will make available to schools a complete line of FM transmitting and receiving equipment.



Portable Public Address Systems

Efficient in operation, look for the new portable public address systems for schools, especially suited for outdoor gatherings and institutions without built-in sound systems.

See your RCA Victor Educational Dealer or write to: Education Department, Radio Corporation of America, Camden, N. J.

EDUCATIONAL DEPARTMENT

RADIO CORPORATION of AMERICA

RCA VICTOR DIVISION, CAMDEN, N.J.

1. 16 mm SOUND MOTION PICTURES

2 BASIC ELEMENTS IN MODERN AUDIO-VISUAL INSTRUCTION TECHNIQUE

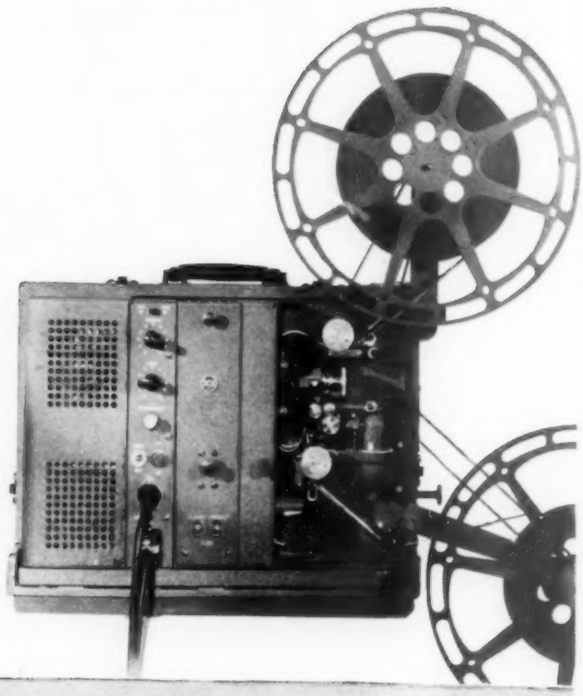
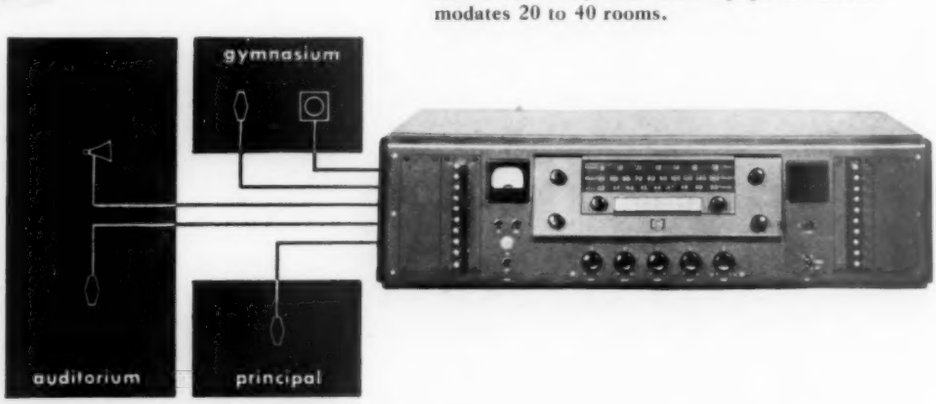


Diagram shows typical installation of RCA Junior Sound System. This equipment accommodates 20 to 40 rooms.



Typical RCA Sound Installations

Ogden High School, Ogden, Utah · Granite High School, Granite, Utah · Maywood Public School, Maywood, Ill. · Camden County Regional High, Camden Co., N. J. · West Catholic Girls High School, Philadelphia, Pa. Hallahan Girls High School, Philadelphia, Pa. · Catholic University Model School, Washington, D. C. Lowell High School, Lowell, Mass. · Marcellus High School, Marcellus, N. Y. · Norwood High School, Norwood, Mass. · Our Lady of Mercy, Rochester, N. Y. · Patrick Henry School, Arlington, Va. · Pleasantville High School, Pleasantville, Pa. · St. Mary's High School, St. Mary's, Pa. · Samuel Tilden High School, New York, N. Y. · Warwood High School, Wheeling, W. Va.

RCA

1. CLASSROOM INSTRUCTION
2. ADULT EDUCATION
3. COMMUNITY ACTIVITIES

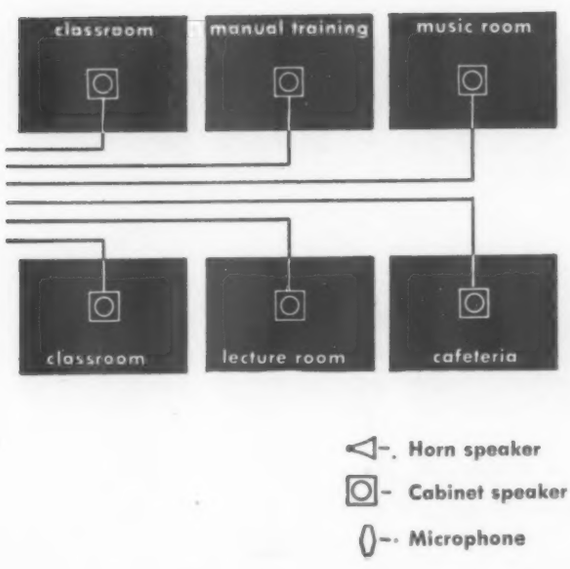
PROBABLY no single teaching aid is as effective, or as versatile, as the 16 mm sound motion picture projector. Used with the many excellent film subjects available, it instantly captures and holds the full attention of the spectator. Subjects which might otherwise be dull or difficult to teach are made lively and interesting through visual techniques. The equipment is also in demand for recreational purposes—teachers' groups, parent-teachers' associations, clubs, etc.

Extensively used in the Armed Services Training Program, and by scholastic and civilian groups of all kinds, RCA 16 mm Sound Projectors enjoy an enviable reputation for finer sound, clearer pictures and greater ease of operation. The same skill and knowledge which underlie RCA's leading position in commercial motion picture recording are reflected in the quality of its 16 mm equipment for schools.



The RCA 16 mm Sound Film Projector, Model PG-201, is a de luxe portable equipment for use in schools. It has a powerful amplifier and specially designed optical system for uniformly brilliant screen illumination.

2. THE SCHOOL SOUND SYSTEM



CENTRALIZED SOUND SYSTEMS are the modern, efficient method of co-ordinating and controlling the school unit; maximum results are achieved with a minimum of waste motion.

The control panel is located centrally, with loud speaker outlets in the classrooms, gymnasium, auditorium, etc. Thus, it is possible for the supervisor to address the entire school body, or any portion thereof, from one location; or to distribute selected programs of radio or records. Optional equipment permits two-way conversations between classroom and microphone locations (talk-back feature).

RCA pioneered school sound systems and is the leading supplier. In addition to the Junior System shown, equipment will be available later for accommodating up to 150 rooms.

RCA VICTOR

Audio-Visual Equipment for Schools and Universities . . . Backed by World-wide Technical Leadership.

RCA Victor Records	Broadcast Equipment
16 mm Projectors	Laboratory Equipment
Sound Products	Electron Microscope
Radios and Victrolas*	Radio Tubes

THE RCA VICTOR RECORD LIBRARY...

Outstanding selection of the world's greatest music is available in the RCA Victor Record Libraries graded for school use according to ages. Basic Libraries for:

Elementary Grades—Albums dealing with rhythms, singing, listening, rhythm bands, Christmas, Indian and Patriotic songs, classified according to age groups.

Junior High School—Organized into sections devoted to: Music of the Dance; Songs—Folk, Art, Ballads; Introduction to the Overture, Symphony and Concerto; Opera; Modern American Music.

Senior High School—Contains outstanding examples of the Overture, Opera, Oratorio, Operetta, Symphony, Concerto, as well as American and Choral Music.





Every classroom and auditorium needs a modern RCA Radio and Victrola phonograph. The new RCA Victor Radios and Victrola Phonographs, containing the exclusive "Golden Throat" tone system, include many models ideally suited to school needs. Remember—only RCA Victor makes the Victrola.*



Model 59VI — Automatic Victrola Radio-phonograph —fine tone and ample volume for auditoriums.

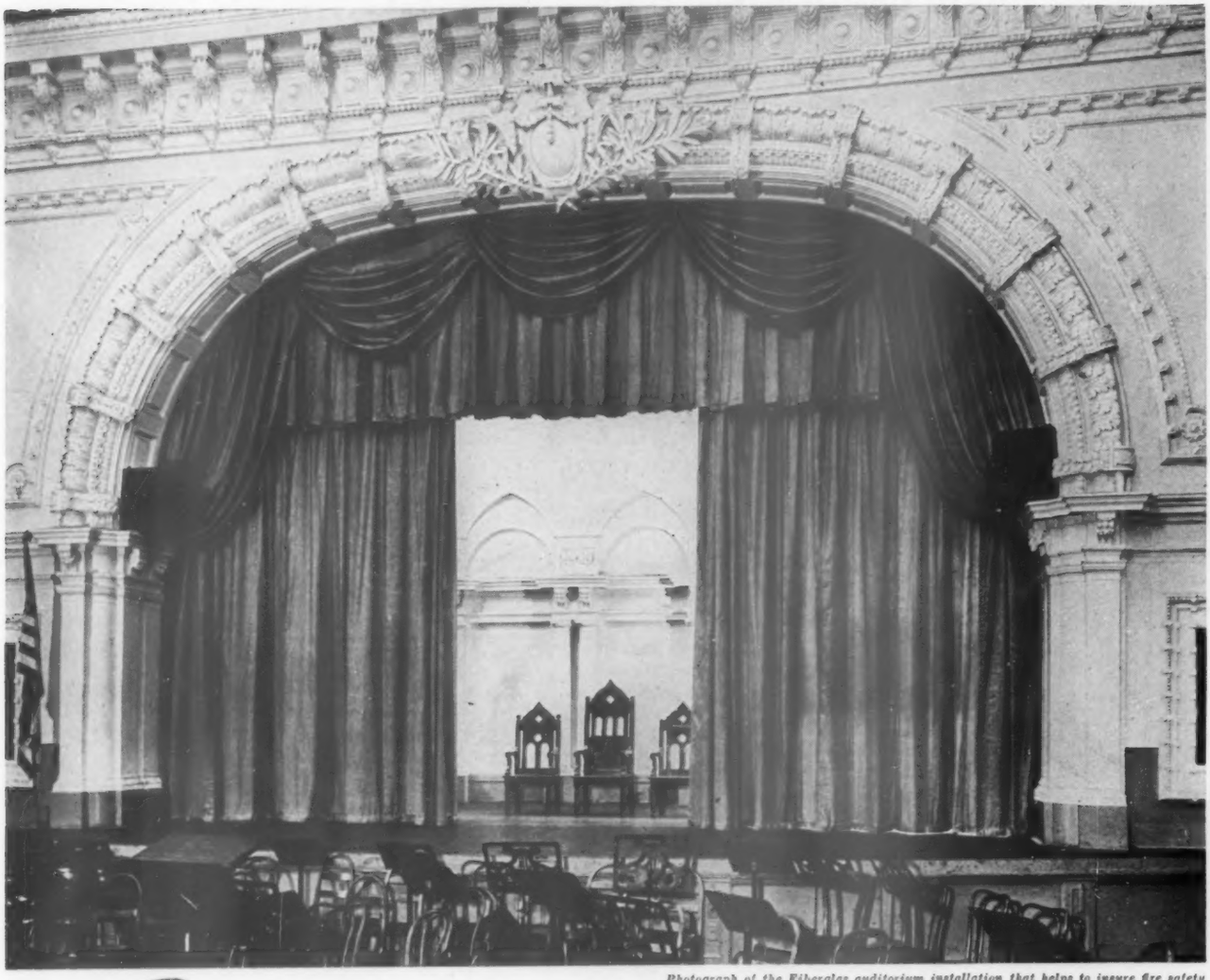
Model 56X — Clear Tone, good volume, sensitive tuning...brown plastic cabinet.

*Victrola—T. M. Reg. U. S. Pat. Off.

EDUCATIONAL DEPARTMENT
RADIO CORPORATION of AMERICA
RCA VICTOR DIVISION, CAMDEN, N.J.

THORTEL FIREPROOF FABRICS

101 Park Avenue, New York 17, N. Y.



Photograph of the Fiberglas auditorium installation that helps to insure fire safety for the pupils of Stuyvesant High School, New York City. Fiberglas fabrics are now available for your school. Remember—they cannot burn! (Installed by Kay Velden Studios.)

Beautiful...and fire SAFE!

Take a good look at these Stuyvesant High School auditorium curtains. You'd never guess that they're made of glass would you? Think of the protection that means for your school audiences—for Fiberglas curtains and draperies CANNOT BURN. Woven entirely of finely spun glass filaments, they never require spraying with flameproofing chemicals; always operate at 100% efficiency. If exposed to fire, will not emit choking fumes. That's why so many school auditoriums in New York, Chicago and St. Louis—and places of public assembly all over the country—have installed Fiberglas fabrics. Their first cost is the last. Available in luscious solid colors, intriguing prints and interesting texture effects.

FIBERGLAS*

Because of the safety-plus features, Fiberglas fabrics are used in all ships of the U. S. Navy (Bureau of Ships Specification 27 C 7). Listed by Underwriters' Laboratories, Inc., as "Non-combustible Fabric"; approved by the Bureau of Standards and Appeals, City of New York.

WRITE FOR SAMPLES AND INFORMATION

THORTEL

FIREPROOF FABRICS

AUTOMATIC DEVICES COMPANY

1037 Linden Street, Allentown, Pa.

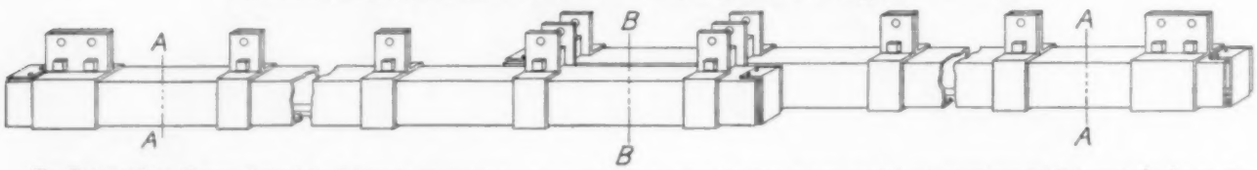
EXPORT DEPARTMENT — 220 W. 42nd Street, NEW YORK, N. Y., U. S. A.

PRODUCTS

"Silent-Steel" Heavy Duty Curtain Track.
"Besteel" Medium Duty Curtain Track.
"Aerial" Type Unit-Combination Track and Machine: ⅓ hp.
"Silver Service" High Speed Curtain Machine: ¼ hp.
"Autodrape" Standard Curtain Machine: ⅓ hp.
"Autodrape" Special Curtain Machine: ¼ hp.
"Stabilarc" Motor-Generator for Projection Arc Supply.

CURTAIN TRACKS

Turnbuckles, Pipe-Batten Hangers, Wall or Ceiling Brackets Supplied as Desired

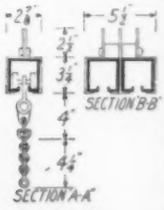


To Determine Gross Length of Track Required—As a basis, start with the clear width of opening which curtain is to uncover; i.e., distance between inside edges of curtain halves when in open position. Add 10% for lap at center for curtain when closed. Add 10% for extension on each end to accommodate each half of curtain when in open position. Total addition is 30%.

Example: Open curtain is to expose 30 ft. clear width. Add total of 30% or 9 ft. for center lap and both end extensions. Specify 39 ft. gross length, in two sections each 19 ft. 6 in.

"SILENT-STEEL" HEAVY DUTY CURTAIN TRACKS

For Any Length—with Curtain of Any Weight



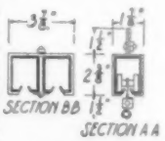
Section Dimensions

Suggested Specifications—Curtain tracks shall be of full-steel construction, 14-gauge, entirely enclosed, except for slot in bottom, each half to be one continuous piece and free of any riveted, welded or other mechanical joints regardless of length, except at center lap. Each curtain carrier shall be supported on ball bearings by two special composition rubber wheels rolling on two separate parallel treads, and all pulley blocks equipped with steel ball bearing wheels adequately guarded; Model No. 280 as manufactured by **Automatic Devices Company** of Allentown, Pa.

"BESTEEL" MEDIUM DUTY CURTAIN TRACKS

For Lengths up to 36 Ft.—with Light or Medium Weight Curtains

Suggested Specifications—Curtain tracks shall be of full-steel construction, 14-gauge, entirely enclosed, except for slot in bottom, each half to be one continuous piece and free of any riveted, welded or other mechanical joints regardless of length, except at center lap. Each curtain carrier shall be of cadmium-plated steel construction supported on self-lubricating bearings by two special composition rubber wheels rolling on two separate parallel treads, and all pulley blocks equipped with steel, ball-bearing wheels adequately guarded; Model No. 170 as manufactured by **Automatic Devices Company** of Allentown, Pa.



Section Dimensions

AUTOMATIC CURTAIN MACHINES

"Autodrape" Curtain Machines

All "Autodrape" machines are equipped with exactly the same gear reduction unit, base and automatic reversing switch mechanism, including the following features:

(1) Limit Switch Arrangement — Adjustment for "open" and "close" positions reduced to simplest form.

(2) Elevator Type Traction Drive—Maximum delivered power without slippage.

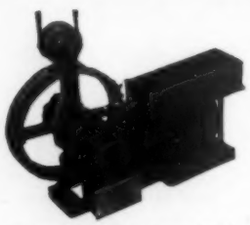
(3) Mounting—Endless cable design allows installation of machine at any position in vertical plane of track.

(4) Disconnecting Clutch—For conversion to hand operation.

(5) Automatic Overload Protective Breaker—Protects machine against excessive loads.

(6) Motor—¼ or ⅓ hp., single phase.

(7) Speed—92 or 115 ft. per minute, equivalent to curtain separation of 2¾ or 3½ ft. per second, respectively (based on 60-cycle current).



"Autodrape" Standard Model

Over-all dimensions: 19½ in. long, 10 in. wide, 15½ in. high

"Autodrape" Special Models—These models have features listed at left and are the lowest priced fully automatic machines on the market; ¼ hp.

Recommended for use with "Silent-Steel" or "Besteel" Tracks up to about 36 ft. gross length.

"Autodrape" Standard Models—In addition to the features listed at left these models include idler system and finger-tip control switch attached to machine; ⅓ hp.

Recommended for use with "Silent-Steel" Curtain Tracks up to about 50 ft. gross length.

"Silver Service" Curtain Machine

This model has all the features of the "Autodrape" Standard Machine. It is equipped with ½-hp. motor delivering a cable speed of 125 or 155 ft. per minute equivalent to curtain separation of 4 or 5 ft. per second.

Recommended for use with "Silent-Steel" tracks up to about 80 ft. gross length.

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Municipal Auditoriums
Masonic Lodges
Y. M. C. A.
Churches
Clubs
Art Museums

For Complete Information and Samples of Track write to Automatic Devices Company, Allentown, Pa.

J. R. CLANCY, INC.

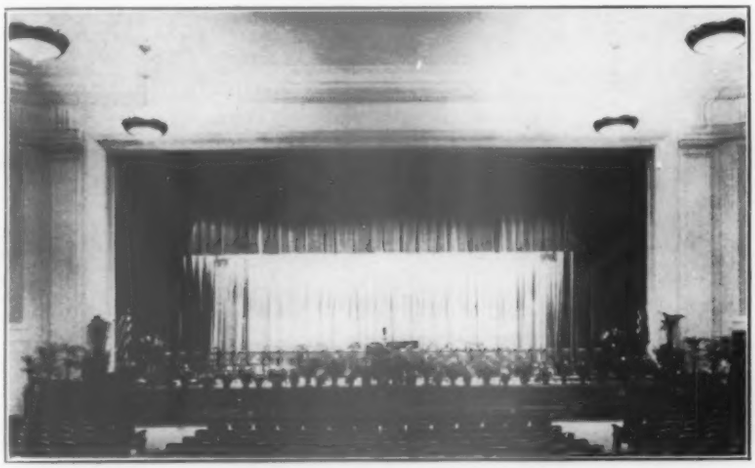
World's Largest Designers, Manufacturers and Riggers of Mechanical Stage Equipment

PROPER STAGE PLANNING MEANS A BETTER STAGE AT LOWER COST

Plan with care the cultural heart of your school . . . the theatre or auditorium. Proper planning of the stage can save you great expense, inconvenience and disappointment. School officials and architects throughout the country call upon Clancy for engineering, manufacture and installation of all types of stage equipment because they prefer to rely upon one firm to supply every item of mechanical stage equipment *under a single contract.* It is better and easier to deal with one contractor than a dozen or more at the same time.

For 60 years Clancy has met the most rigid tests for quality. Our first emphasis is upon safety . . . the safe operation of equipment much of which is suspended over the heads of performers.

School officials are invited to consult us *in advance of the drawing of plans* for a new building or a remodeled auditorium. This involves no obligation whatever. We can save you expense and delays in construction by visualizing your stage for you with blueprints, specifications and estimates.



Typical School Installation by Clancy . . . Olean High School, Olean, N. Y.

Every Clancy Item Carries the Clancy Label of Quality

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Clancy Contour Curtains
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Curtain Tracks for Trouping
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Wagon Stages
Revolving Stages
Bull Wheels
Magnascopes
Picture Screens
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Electric Winches
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Traction Drive Equipment
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*** University of Porto Rico**
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*** Alleghany High School—Pittsburgh, Pa.**

** Installed by Clancy authorized agents.*

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Akron, Ohio

Originators and Exclusive Manufacturers of NOISELESS CURTAIN TRACK, CONTROL EQUIPMENT, SPECIAL OPERATING DEVICES . . . . .

NO STAGE TOO LARGE—NONE TOO SMALL!

THE SEAL OF 11 LEADERSHIP — Vallen — TRADE MARK REGISTERED — WORLD'S LEADING MAKER OF CURTAIN CONTROLS AND TRACKS

NOW! MORE IMPRESSIVE SCHOOL CEREMONIES AND THEATRICALS!

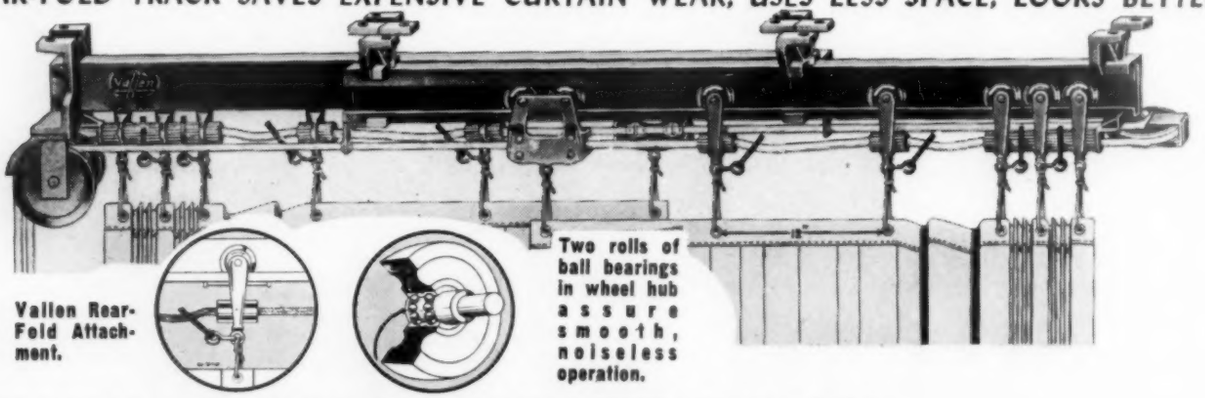
For years Vallen has been the world's leading manufacturer of theater curtain tracks, control equipment and special operating devices. Today, this same fine equipment is available for school use—to provide professionally smoother ceremonies and theatricals. You'll find that it will pay to consult Vallen for every school stage equipment need.

ROUND-THE-CORNER TRACK MOVES STAGE CURTAINS SMOOTHLY, NOISELESSLY AROUND CORNERS

LIKE THIS!

Vallen Round-the-Corner Track opens the way to a flexible "all purpose" stage installation. With this "2 in 1" track, it is possible to provide a fresh scene by manual or push-button control! What *was* front curtain becomes back. Or, if you wish it, what was a large stage becomes a small one. Use this modern track to simplify your school stage problems. It's simple, quick, unfailing!

REAR-FOLD TRACK SAVES EXPENSIVE CURTAIN WEAR, USES LESS SPACE, LOOKS BETTER!



Vallen Rear-Fold Attachment.

Two rolls of ball bearings in wheel hub assure smooth, noiseless operation.

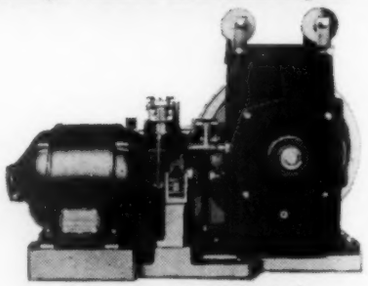
THERE IS A VALLEN ALL-STEEL SAFETY TRACK FOR EVERY STAGE

Vallen Rear-Fold Track is hailed as one of the most important stage equipment inventions ever made. Curtains move back as one smooth, ungathered surface . . . attractive designs and scenic effects are unmarred by folds . . . titles stay clear and free from distortion. All curtain folding takes place at extreme ends—out of spectators' view. Curtains operate with greater ease and smoothness than on any other type of track. Years are added to curtain life.

Another Vallen track is the Deluxe No. 150. For years this has been recognized as the safest, most efficient unit of its kind. Manually or electrically operated, this Noiseless Track assures continuous, long-term, trouble-free, maintenance-free operation.

Another fine Vallen All-Steel Safety Track is the Intermediate No. 200. Many curtains are too heavy for light-duty equipment, yet do not require the extra carrying and operating capacities of Vallen Deluxe or Heavy-Duty tracks. Intermediate Track, as the name implies, is intended for such service. Its reasonable price eliminates all necessity for employing obsolete wooden track or overloading light equipment.

AERO-SPEED CONTROL —Select Speeds!



Vallen Aero-Speed Control

VALLEN PUSH-BUTTON CONTROL CAN BE OPERATED EASILY BY ANYONE!

Vallen offers the best answer to any school's most complicated curtain control problem. A typical Vallen control is the Aero-Speed, which operates curtains at any selected speed between 40 and 228 ft. per minute. Curtains are controlled by remote control from a conveniently-located electric push-button station. Press the button and curtains move; press it again—they stop instantly . . . no coasting. Press the button the third time, and they reverse. Install Vallen Aero-Speed in your school auditorium and assure years of satisfactory, trouble-free operation.

CAPITOL STAGE LIGHTING COMPANY

E. ALTMAN, Proprietor

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- Etc.

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Originators and Manufacturers of "KLIEGLIGHTS"

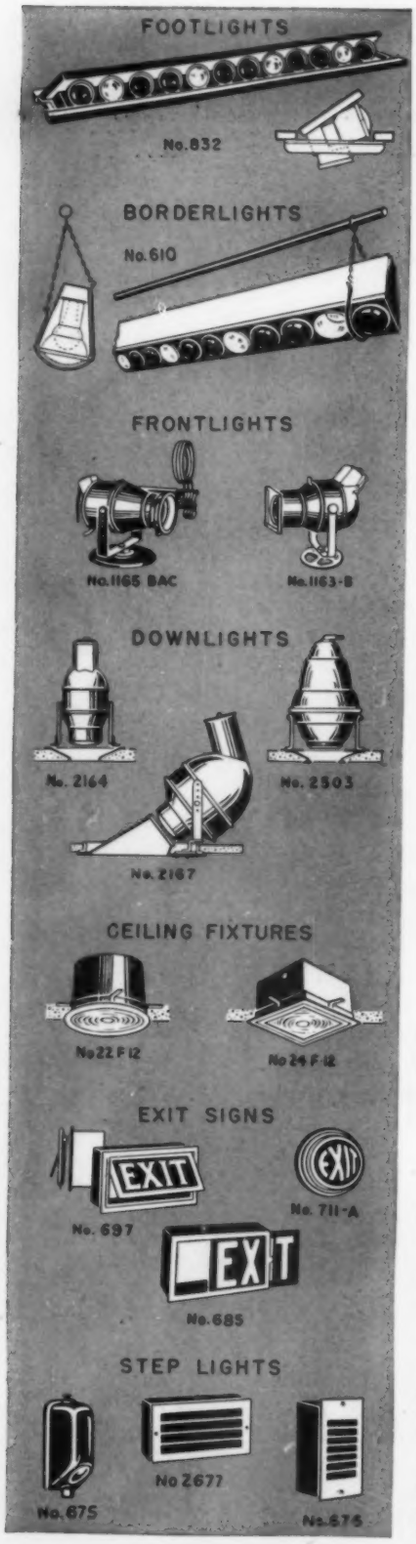
KLIEGL BROS.

UNIVERSAL ELECTRIC STAGE LIGHTING CO., INC.

EST. 1896

STAGE and AUDITORIUM LIGHTING

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THIS MARKS OUR 50TH YEAR as specialists in stage lighting. The test of time has proven the merits of our output and the qualifications of our staff. Most of the prominent schools and theatres in the country today are Kliegl equipped—and we approach the future with every confidence that our patrons of tomorrow will be as well satisfied with the performance of our newly-made products as our customers of years past.

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When your plans are being formulated for desired improvements or contemplated construction—we can help you with our comprehensive knowledge of lighting—and assure you that the most practical ideas and latest developments will be incorporated in our suggestions.

PRODUCTS

Conventional and special equipment of every description for stage, auditorium or architectural lighting is manufactured for your needs—footlights, borderlights, spotlights, floodlights, striplights, scenic effects and projectors, cove lights, downlights, ceiling fixtures and countless other items.

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Ample facilities and skilled workers assure satisfactory fulfillment of commitments, and our engineers are available for consultations on your lighting problems.

INQUIRIES

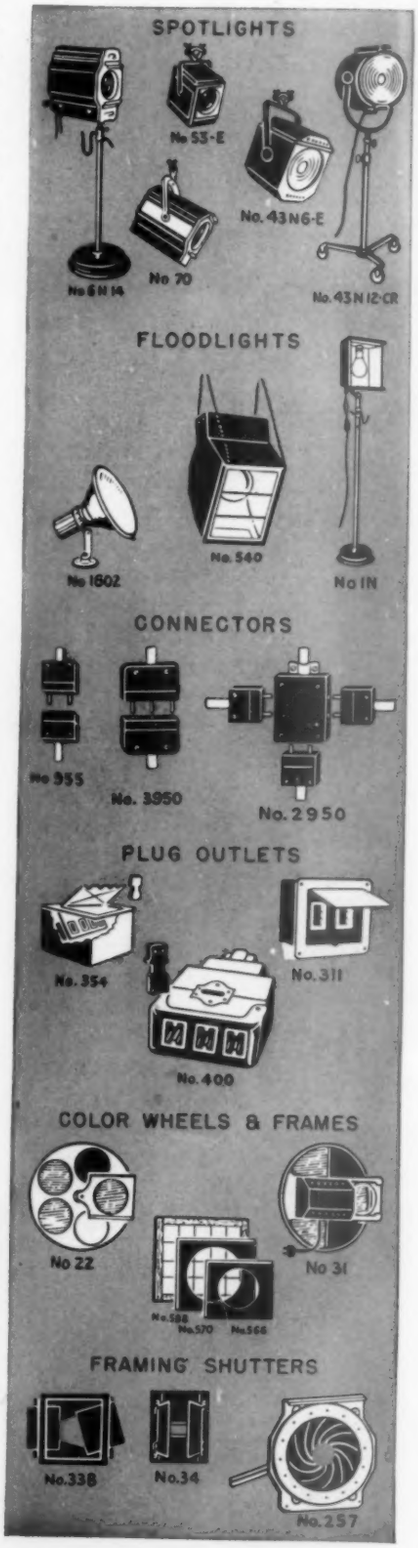
Literature and other information regarding our products or their use furnished on request. Write or phone us regarding your immediate needs or future requirements.

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High intensity beam projectors with ellipsoidal reflectors, lens system, and coordinated shutter arrangement which permits regulation of size and shape of light beam.

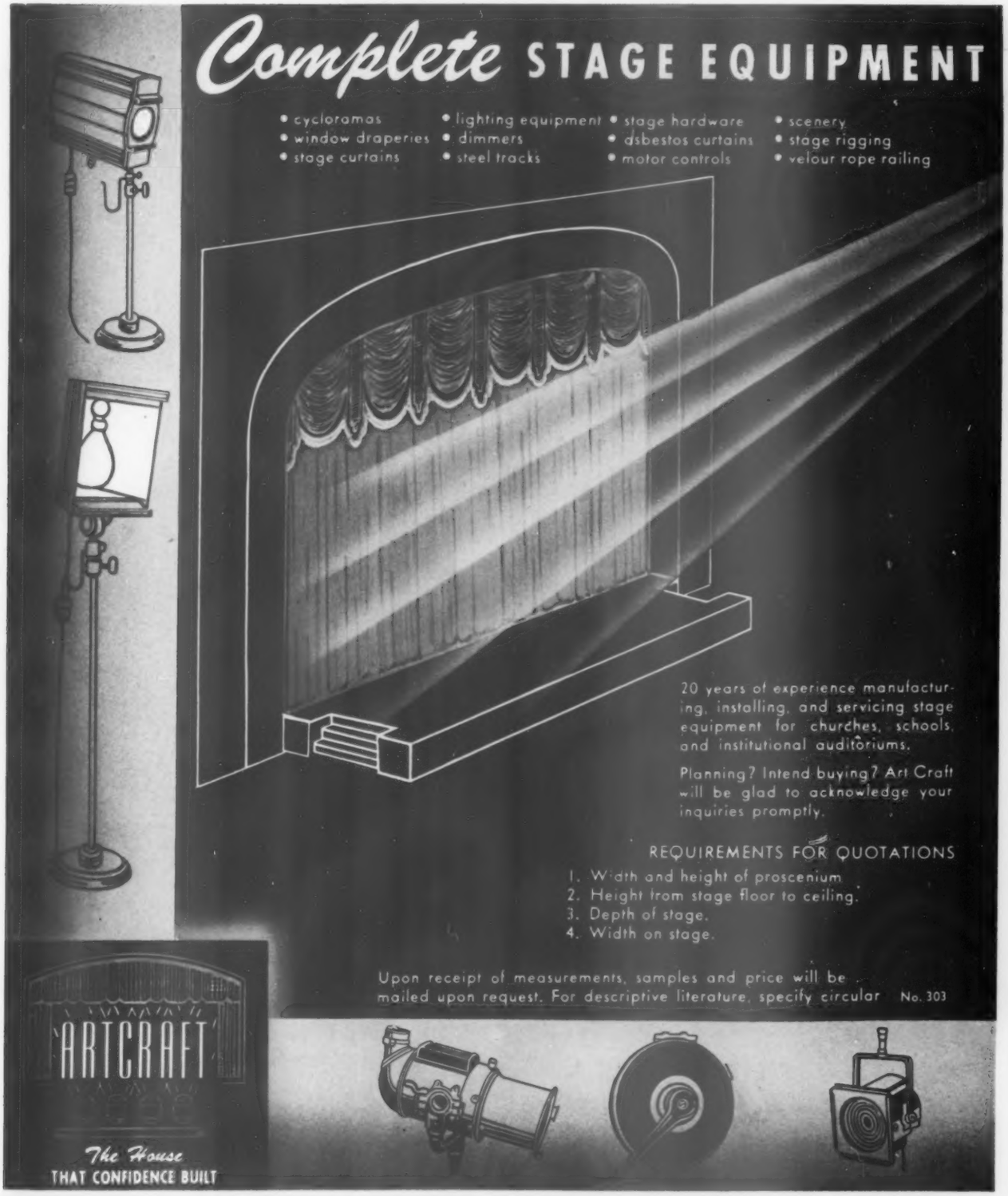
Portable units have an in-built four-way shutter system, with external controls to facilitate quick and easy adjustments. Permanently installed units have a drop-in shutter arrangement. Full particulars on request.





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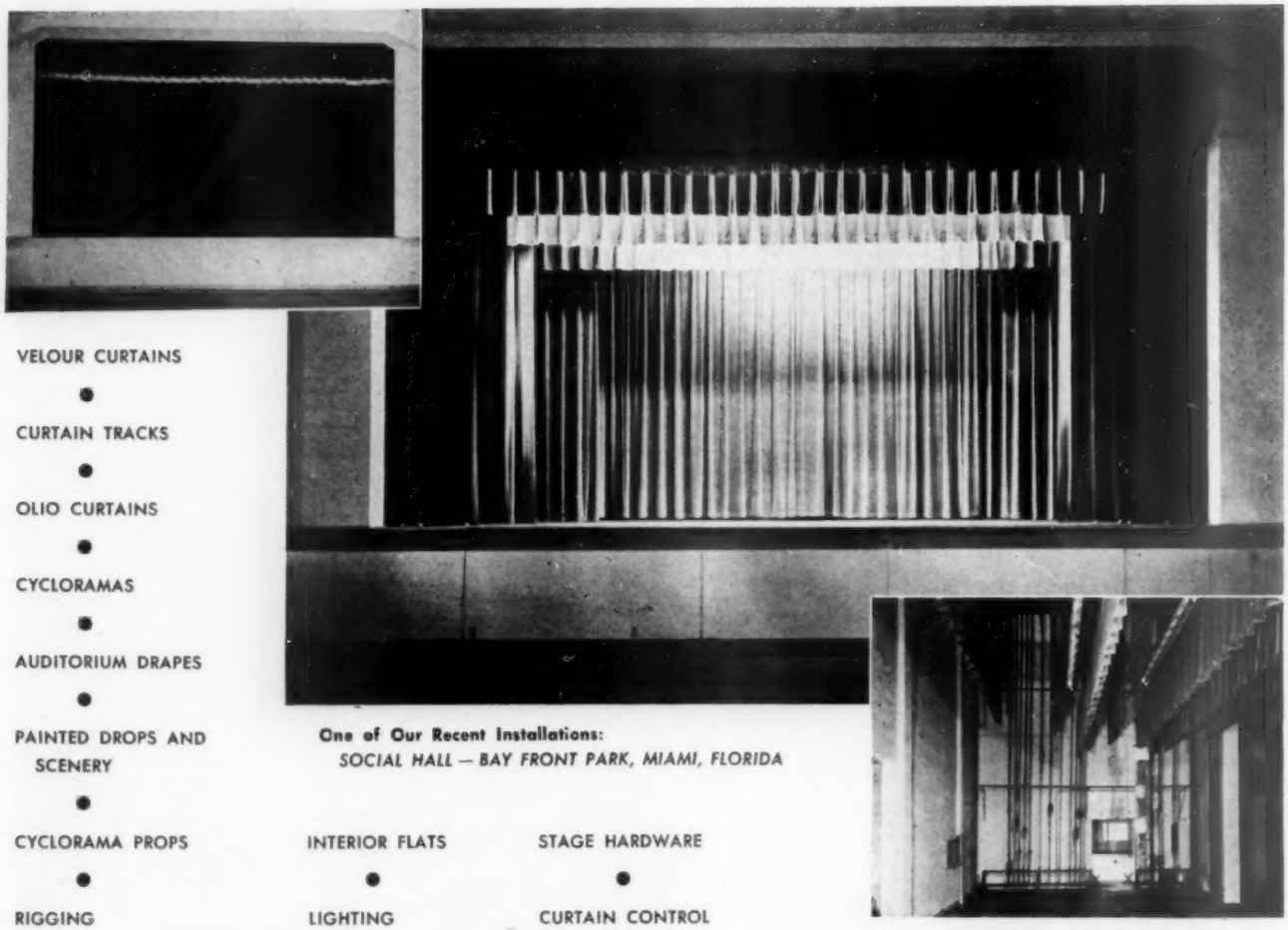
KNOXVILLE SCENIC STUDIOS

609 Phillips Avenue, Knoxville 4, Tenn.

Tel. 3-0854

Designers and Creators of

"DISTINCTIVE STAGE EQUIPMENT"



VELOUR CURTAINS
●
CURTAIN TRACKS
●
OLIO CURTAINS
●
CYCLORAMAS
●
AUDITORIUM DRAPES
●
PAINTED DROPS AND SCENERY
●
CYCLORAMA PROPS
●
RIGGING

INTERIOR FLATS
●
LIGHTING

STAGE HARDWARE
●
CURTAIN CONTROL

One of Our Recent Installations:
SOCIAL HALL — BAY FRONT PARK, MIAMI, FLORIDA

EXPERIENCE:

Our long experience in the furnishing of complete stage equipment enables us to offer you a service of the highest professional type. Whatever your stage requirements may be, we welcome the opportunity of serving you.

QUOTATIONS: When requesting quotations please furnish us with the following data:

(1) Width of Stage Opening
(2) Height of Stage Opening
(3) Depth of Stage—Front to Back
(4) Height of Stage Ceiling
(5) Width of Stage—Wall to Wall

SERVICE:

We will gladly help you prepare specifications, furnish drawings and blueprints, and give you free estimates on your stage equipment.

Samples, Designs and Blueprints—Sketches furnished for all jobs, large or small.

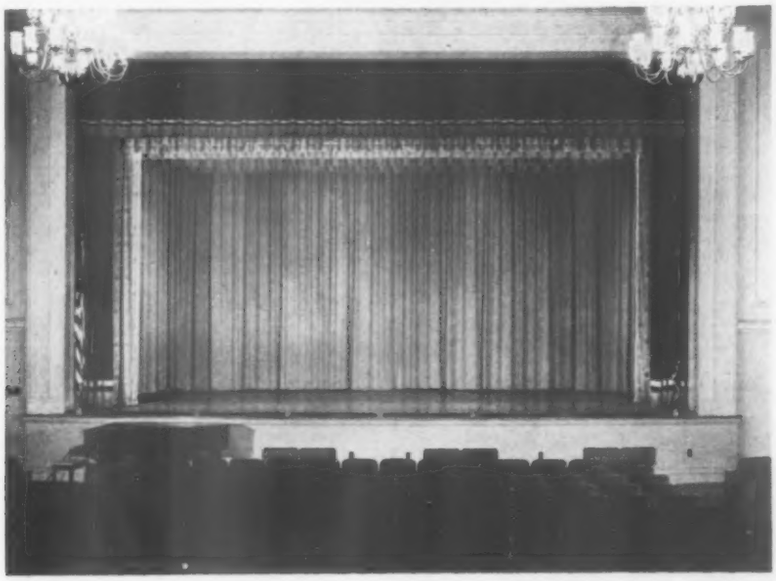
We carry a large stock of materials at all times and can give immediate service.

MORK-GREEN STUDIOS, INC.

Producers of
Complete Stage Equipment

243 W. Congress Street
DETROIT 26, MICHIGAN

702 Chimes Building
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VELOUR CURTAINS
CURTAIN TRACKS
CURTAIN CONTROLS
CYCLORAMAS
PAINTED SETTINGS
WINDOW DRAPERIES
ELECTRICAL EQUIPMENT
COUNTERWEIGHT RIGGING
STAGE HARDWARE
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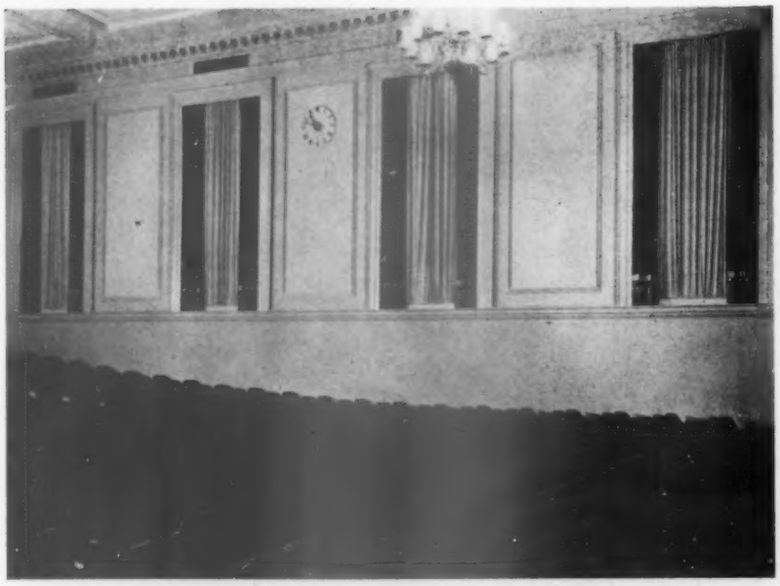
OUR FACILITIES have been expanded to meet a large volume of business and still maintain our high standards of quality.

Let us help plan your Stage Equipment lay-out.

No obligation involved.

List of outstanding installations in your locality on request.

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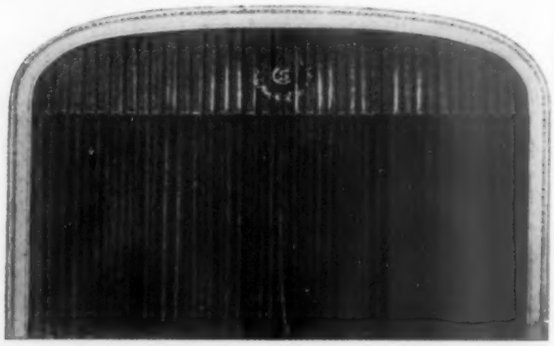


AUDITORIUM IN CATO-MERIDAN CENTRAL SCHOOL, CATO, N. Y.
Paul W. Seagers, *Supv. Prin.* Carl C. Ade, *Arch.*

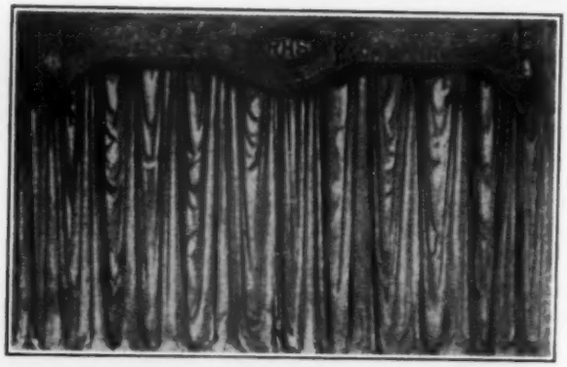
NOVELTY SCENIC STUDIOS, INC.

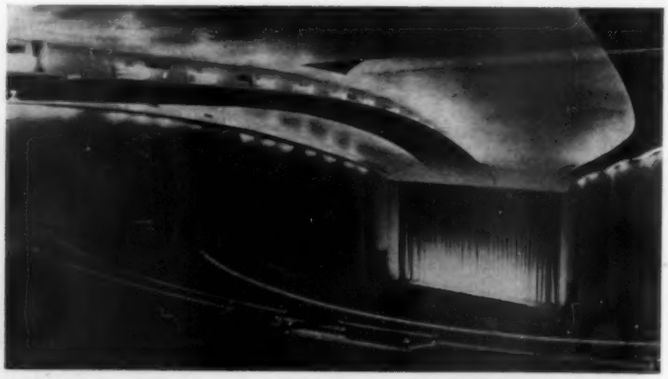
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Specialists... in the creation of smart interiors for more than 27 years



Stage Curtains
Scenery
Draperies
Stage Rigging
Curtain Tracks
Asbestos Curtains







Above—Stage draperies in main auditorium of $2,400,000 theater and art center of the University of Wisconsin

Left—Curtains and draperies in the Virginia State Library and Supreme Court Building, Richmond, Va.

★

YOUR SCHOOL STAGE:

Let our experts recommend a professional and economical layout for your school stage or auditorium windows.

Whether your requirements are large or small, you will find our organization attuned to render maximum service.

Write Us!

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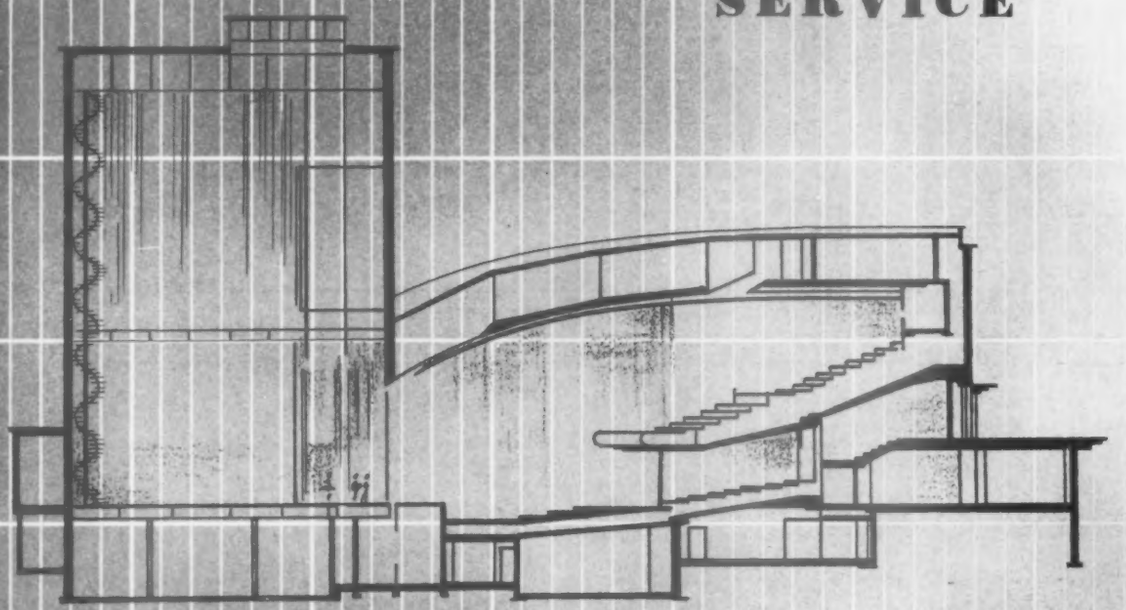
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TPS INC.

Everything for the Theatre

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445 West 45th Street, New York City

ESTABLISHED IN 1900

QUALITY *first* - - - QUALITY *always*

We have never compromised with quality. Too often, inferior materials and fabrics have been used with the result that there are countless auditoriums with faded, shabby curtains and broken-down equipment.

Upon request we will submit a list of jobs we installed over 15 years ago which are still in good condition.

WE DESIGN — MANUFACTURE and INSTALL

STAGE CURTAINS
ASBESTOS CURTAINS
WINDOW CURTAINS
CYCLORAMA CURTAINS
SCENERY
COUNTERWEIGHT RIGGING
STAGE CURTAIN TRACKS
PICTURE SCREENS
STAGE HARDWARE
SPOT, FLOOR, BORDER LIGHTS

STAGE DESIGNERS WE HAVE SERVED

Boris Aaronson
Lemuel Ayres
Howard Bay
Stewart Chaney
Raul Rene DuBois
Frederick Fox
Norman Bel Geddes
Edward Gilbert
George Jenkins
Robert Edmond Jones
Samuel Leve
Jo Mielziner
The Motley's
Donald Oenslager
Lee Simonson
Raymond Sovey

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Life With Father
Showboat
Oklahoma
Lutesong
State of the Union
Carousel
Born Yesterday
Dream Girl
Annie Get Your Gun
Harvey
Icetime
Glass Menagerie
Anna Lucasta

SCHOOLS WE HAVE SERVED

Hunter College, New York City.
George Washington University, Washington, D. C.
Jefferson High School, Rochester, N. Y.
Glen Cove High School, Glen Cove, N. Y.
New High School Building, Thomaston, Conn.
Trenton, N. J.—Board of Education
Elizabeth, N. J.—Board of Education
Montclair, N. J.—Board of Education
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SUPPLIED ALL VELOUR COVERINGS AND CYCLORAMA CURTAINS FOR THE UNITED NATIONS CONFERENCE AT THE SAN FRANCISCO OPERA HOUSE, U. S. GOVERNMENT, STATE DEPARTMENT

FABRICS Weiss Fabrics—velours, damasks, home-spuns and cycloths—in quality, design and color are the finest available and are guaranteed.

FLAMEPROOFING Applied by experts, is fully guaranteed and complies with rules of the New York Board of Standards and Appeals, Administrative Code of the City of New York. Affidavits will be furnished.

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A COMPLETE LINE OF PERMANENTLY FIRE-PROOFED, DYED, GLASS FABRICS

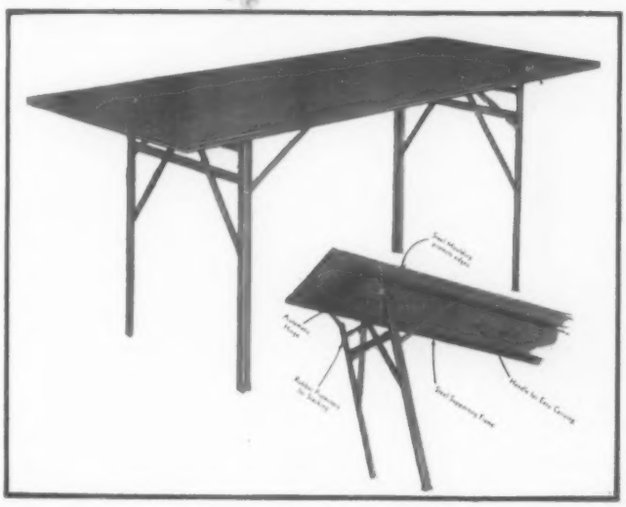
Write for Catalog — "Setting the Stage"

I. WEISS & SONS HAVE BEEN IN BUSINESS CONTINUOUSLY FOR 46 YEARS

THE BREWER-TITCHENER CORPORATION

118 Port Watson St.
Cortland, New York

Hostess FOLDING PRODUCTS



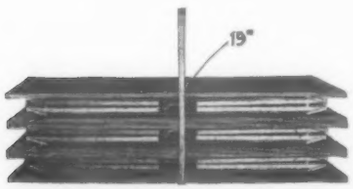
FOLDING BANQUET TABLES

The construction feature of an all-steel frame (Note illustration) gives exceptional lightness with superior strength and rigidity. Frame and legs are of 1 x 1 x 7/64" high carbon angle steel. The legs are finished in buff, and the frame black enamel.

One man can quickly set them up or knock them down by a simple swing of the legs. The legs operate in units of two. Automatic locking device with positive catch requires no manipulation.

The tops are regularly furnished with beautifully grained ply panel, finished with two coats of heat and stain resisting hot-spray lacquer. All tops are oil dipped to resist warpage, and all edges are protected with an attractive steel moulding around the entire top.

Obtainable in various sizes including the rounds; also with tempered masonite and linoleum tops.

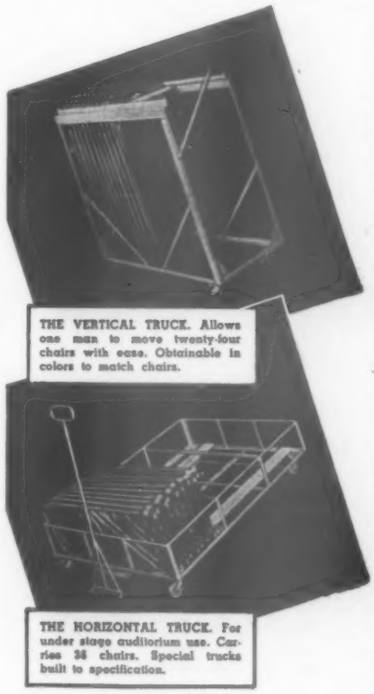


Stacks 6 to 19½ Inches



ALL METAL FOLDING CHAIRS

DELUXE FOLDING CHAIRS



THE VERTICAL TRUCK. Allows one man to move twenty-four chairs with ease. Obtainable in colors to match chairs.

THE HORIZONTAL TRUCK. For under stage auditorium use. Carries 36 chairs. Special trucks built to specification.

Hostess DeLuxe chairs depart entirely from old time construction principles. Here is a full back and full seat all-steel, all-riveted folding chair, upholstered both back and seat. When folded, the upholstering is between two protecting metal parts that form back and seat, thus eliminating danger of damage to upholstery during storage. Hostess DeLuxe chairs are obtainable in many color combinations and all metal parts are finished in beautiful metallic colors. All chairs are equipped with large pure rubber feet.

AMERICAN SEATING COMPANY

Grand Rapids 2, Michigan

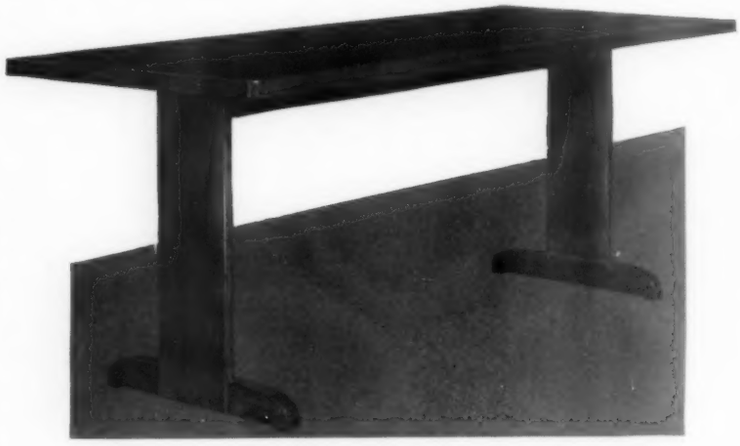
WORLD'S LEADER IN PUBLIC SEATING

American Seating Company school furniture embodies the very highest standards of serviceability, practical adaptability, hygienic comfort, and sight conservation. More than half a century of research and manufacturing experience has developed greatly improved methods of construction and striking advances in artistic styling. Each product is tested by the most thorough and rigorous methods known, to insure uniform quality throughout.

AMERICAN UNIVERSAL TABLES

All-Purpose Tables Attractive and Serviceable

In the fine-furniture class but at school-budget prices, American Universal Tables are truly remarkable values. Heavy, core ply construction, protected and reinforced by perfectly joined and mortised hardwood framing; is superior to solid-wood construction of equal thickness, and offers greater resistance to warping, checking and splitting. No corner legs or other parts to interfere with knees or limbs. No weak glue joints to get loose. Graceful hardwood standards provide strength to withstand the hardest use. Finished with durable high-grade lacquer.



Library or Board Room Table — Size of top: 36 x 72 inches

Available in the following sizes of top: 24 x 48", 30 x 60", 30 x 72" and 36 x 72". Each top size is available in the following heights: 20", 22", 24½", 27", and 29". Strong plywood book compartments optional on one or both sides in all sizes.

American Universal Tablet-Arm Seat No. 372



University type chair of graceful design and soft-toned coloring that harmonizes with any architectural style. Solidly constructed for generations of severest use with minimum maintenance. Deep curved, comfortable back is of ¾" 7 ply selected-face plywood, casein-glued with rounded edges. Solid hardwood seat with universal saddle form. Seat height 17". Tablet arm, 12 x 24".

American Envoy Posture Chair No. 368



Classroom chairs constructed on the greatly improved principle combining clean-cut functional beauty with perfect comfort and postural design. Light, strong, easy to handle. Rigid construction eliminates all squeaks and rattles, provides utmost strength at points of greatest strain. Lower back rails are noiselessly self-adjusting. Wood seat edges are fully protected by the steel frame. Equipped with silent insulated steel gliders. 4 sizes: 11", 13", 15" and 17" seat heights.

American Envoy Tablet-Arm Chair No. 378



An unapproachable value in the low-priced tablet-arm chair field. Constructed to withstand long years of severest classroom usage. Utmost posture and comfort qualities are assured by deep curved back with silent, self-adjusting lower rail, formed seat and precisely sloped tablet arm. Has silent, cushioned gliders. Seat height, 17". Table-arm 12 x 24".

AMERICAN SEATING COMPANY

Grand Rapids 2, Michigan

WORLD'S LEADER IN PUBLIC SEATING

You get more for your money in American Seating Company's school furniture because improved production methods and manufacturing equipment make possible new economies with no sacrifice of quality. World leadership has been achieved by American Seating products through a policy of increasingly higher standards made possible by continuing laboratory research and testing, and rigid inspection procedures. In this way, "American" quality is safeguarded always, and you are assured long, economical service and lasting satisfaction.



AMERICAN UNIVERSAL BETTER-SIGHT DESK No. 333

The world's finest desk in every respect—comfort, sight conservation, posture, design, materials, finish and construction. The one-piece steel lifting-lid book-box has a durable, strongly reinforced solid hardwood top, extra large capacity, sloped or level writing positions, and non-slam friction control—with no exposed movable parts. Seat is scientifically designed to make erect sitting comfortable, natural and less fatiguing. Self-adjusting lower back rail, and seat scoop with no rearward elevation fit every occupant. Seat swivels 45 degrees each way to silent, cushioned stop. Frame has maximum strength and stability, with fluted foot rest, solid metal gliders, and smooth-working, unobtrusive height-adjustment clamp. Sturdy, rigid, yet light and easy to move.

DIMENSIONS

Size	Grades	Seat Height	Desk Height	Total[1] Length	Desk[2] to Back	Seat Depth
C	I-III	11½-15½"	23-28"	28⅝"	9 and 10"	10½"
B	II-VI	11½-15½"	23-28"	29⅝"	10 and 11"	12¼"
A[3]	V-Adult	14 -18"	26-31"	30⅝"	11 and 12½"	14"

1. Seat swiveling requires 3-inch additional floor space.
2. Both spacings provided for in seat construction.
3. Size A equipped with X seat (15½ x 17½) is available as Size AA.

American Envoy
Desk No. 362



The strongest, most comfortable and durable desk of its type ever built. The tubular support and never-failing clamp provide desk-top adjustment with the loosening of a single bolt. Has roomy, sanitary book storage cabinet. Deep curved back rails promote comfort and good posture. Self-adjusting lower rail mounted on silent pivots. Has steel cushioned gliders. Made in three sizes, perfectly proportioned to 13", 15" and 17" seat heights.

American
Folding Chair No. 44



Popular-priced, general-purpose chairs with remarkable built-in values of great strength, durability and comfort. Seat is shaped from 5-ply hardwood with rounded edges — walnut stained and lacquered. Reinforced steel frame and back panel are bonderized, taupe enameled and baked. Main frame is reinforced for added wear. A real posture folding chair with smooth, clean lines and freedom from catching and pinching hazards.

American Bodiform
Auditorium Chair No. 12-001



The most highly praised auditorium chair in the history of public seating. Combines modern, streamlined beauty with maximum comfort and more room for sitting and passing at standard spacing. Automatic seat-fold action with completely self-adapting hinge construction. No pinching or tearing hazards. Upholstery is quickly, easily replaceable. Provides greater economies of maintenance, space and service. Other auditorium chairs available with plywood back and seat or upholstered types.

MITCHELL MANUFACTURING CO.

Milwaukee, Wisconsin

Playground Apparatus
Beach and Pool Equipment
Fold-O-Leg Tables and Benches

"Betterbilt"

Folding Choral Elevations
Folding Band Elevations
Sanitary Barn Equipment

FOLD-O-LEG TABLES

For cafeterias, sewing rooms, study tables, kindergartens, commercial departments, social rooms, recreation centers, table tennis, etc., or wherever stationary or portable tables are needed Fold-O-Leg Tables are designed to meet the highest standards of ruggedness, beauty and useability. Tubular steel legs are built to give a lifetime of rigid tables use. All tables over 5 feet long fold into a depth of only 2½ inches. Made in convenient sizes and heights. Tops of plywood, Tempered Masonite Presdwood or linoleum. Write today for Booklet No. 3.



LEGS FOLD UNDER

Easy Storage—Less Space

25% Greater Seating Capacity

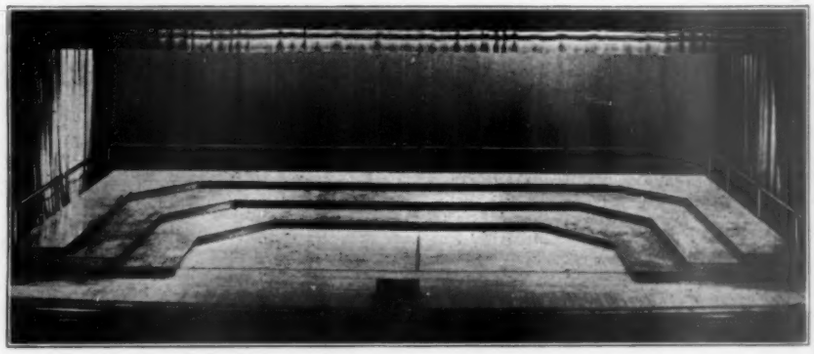
BOOKLETS (Illustrated)

1. "BETTERBILT" PLAYGROUND APPARATUS
2. "BETTERBILT" POOL EQUIPMENT
3. FOLD-O-LEG TABLES AND BENCHES
4. FOLDING CHORAL ELEVATIONS
5. FOLDING BAND ELEVATIONS
6. SANITARY BARN EQUIPMENT

STEEL-LEG PORTABLE FOLDING STANDS

FOR BAND, ORCHESTRA AND CHORAL GROUP ELEVATION, ALSO PLATFORMS FOR PLAYS, ETC.

Mitchell Portable Stands can be adapted to any need. Constructed in rigid units easy to handle. Rapidly moved from music room to auditorium stage or even to other places for concert work. Minimum storage space required for folded units and demountable safety steel rail. Available in any size. Thoroughly tested by many outstanding educational institutions. Write today for Booklets No. 4 and No. 5.



PARTIAL LIST NOW USING MITCHELL PORTABLE FOLDING STANDS

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New Haven, Connecticut

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South Bend, Indiana

Michigan State College
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LaSalle, Illinois

Vaughan General Hospital
Hines, Illinois

Board of Education
Robbinsdale, Minnesota

Villanova College
Villanova, Pennsylvania

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Milwaukee, Wisconsin

Wheaton College
Wheaton, Illinois

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EMPHASIZES USE OF...

Color, Design and Function

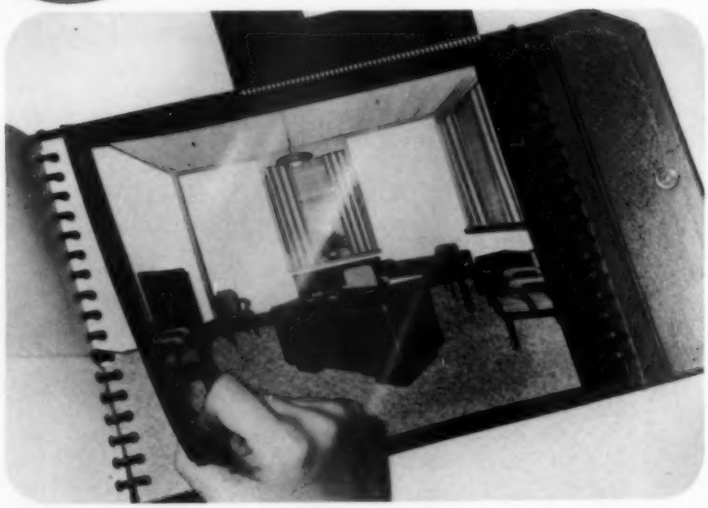
IN PLANNING THE MODERN OFFICE



- **COLOR** *for Harmony and Light Refraction*
- **DESIGN** *for Appearance and Comfort*
- **FUNCTION** *for Efficiency*

YAWMAN AND ERBE MFG. CO.

"Y and E" THREE-FOLD SERVICE FOR MODERNIZING



1. COLOR HARMONY *Visualized*

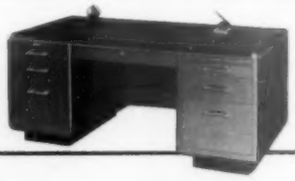
2. DESIGN *Modern but not Moderne . . .*

A Complete Family of Steel Desks for:

THE EXECUTIVE
THE ASSOCIATE
THE GENERAL OFFICE

Files and Counter Equipment

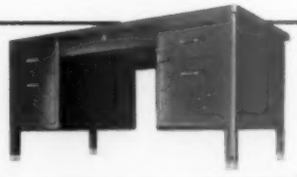
STYLED EXECUTIVE

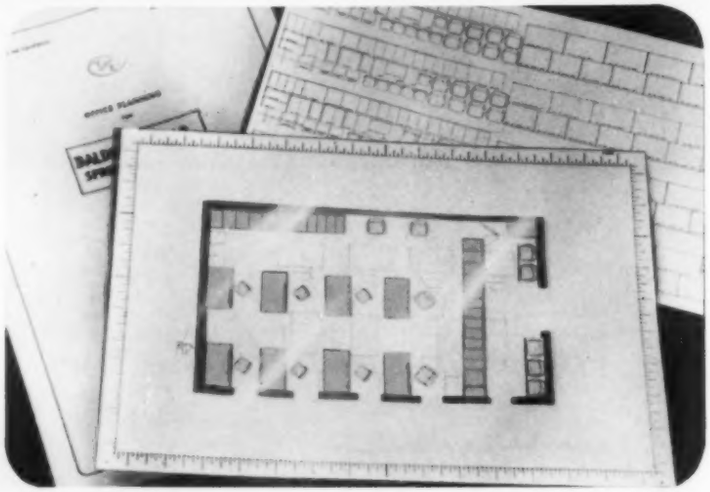




STYLED ASSOCIATE

STYLED SUSPENSION
FOR GENERAL OFFICE





3. FUNCTIONAL *for Efficiency*

PLANNING FLOW OF WORK TO USE FLOOR SPACE TO BEST ADVANTAGE

Making a graphic portrayal by use of portable Scaled Dimensional Equipment Blocks

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

NG AND FUNCTIONALIZING THE OFFICE IN STEEL

Color

Recognizing that office efficiency bears a definite relationship to the worker's surroundings—whether top executive or junior clerk—"Y and E" engineers several years ago began a series of tests that have revolutionized office planning and layout.

The chief factor in any office is the equipment. The greater part of every worker's time is spent at his desk, hence "Y and E" engineers selected the desk as the keynote of the whole plan of stepped up work efficiency.

In so doing they took recognition of a long neglected factor of the utmost importance to the user of that desk, namely, eye fatigue. Too great contrast . . . too little contrast require extra muscular adjustment by the worker's eyes—cause headaches, tiredness and all the many familiar symptoms of eye fatigue.

To correct this condition "Y and E" engineers, after three years of research, developed Neutra-Tone Gray, an entirely new finish for office equipment. It is a special and exclusive blend of various pigments that reduces light absorption 30%. One of the nation's leading illumination experts has pronounced Neutra-Tone Gray to be a *warm gray* and a scientifically correct finish having a minimum of glare and light absorption.

It was soon recognized that the color harmony of the offices was an important factor in still further increasing working efficiency. The blending qualities of the Neutra-Tone Gray finish immediately made possible a much larger number of decorating combinations than had ever been available with a single color.

By so greatly expanding the possible combinations, you may now plan the exact color scheme that best suits your requirements . . . without the expense of special furniture finishes.

Color Combinations

To help you visualize to the fullest the possibilities of this important new color development, our engineers have prepared an ingenious four-way *color visualizer* that enables you to study a large number of possible color combinations. Colors have been selected for:

1. Standard colors for wall paints.
2. True lithographed reproductions of rugs and carpets.
3. Window drape reproduction in color.

All these color units are so fastened in a ring binder that any combination can be brought together conveniently. To this is added a transparent sheet on which is printed office furniture in Neutra-Tone Gray finish. Thus, you can study all the important factors that enter into selection of an office color scheme, and prove that the new "Y and E" Neutra-Tone Gray will harmonize with all decorative elements. You may obtain the use of this color visualizer merely by calling or visiting the "Y and E" Branch or representative in your city.

Designed for Comfort and Harmony

The complete family of "Y and E" "Style Master" steel desks and tables covers every type of office work space requirement. The "Executive," the "Associate," and the "General Office" lines are designed to function in a modern efficient manner.

The comfort and harmony factors stressed in the design of the "Style Master" (4900 line) steel executive desk are:

Streamlined for appearance and architectural conformity.
Molded non-glare linoleum top to ease eye strain and do away with uncomfortable edges.
All outside corners and edges molded (no sharp corners).
Trim (drawer pulls, etc.)—especially designed to conform with contour of desk.
Wide pedestals (cap size)—to balance proportions.
Base—recessed box type, black enameled.

The "Styled Executive" (4900 line) is the result of much study and consultation with many of the top ranking business executives and architects of the country.

Architects specializing in office modernization recommend "Y and E" "Style Master" steel desks because their modern design and balanced appearance conform with the lines of present day plans for office buildings and their interiors.

The "Styled Associate" (6900 line), illustrated more completely on pages 6 and 7 of this catalog section, has the same general streamlined design, the same smooth rounded corners and edges for comfort and harmony. These steel desks, like the executive line, are designed without legs to give greater knee space and more foot freedom. One principal difference is the base unit—instead of a recessed box base, there is an island base under each pedestal. These desks are adjustable in height to the individual's requirement.

The "Styled Suspension" (7900 line) is a complete alternate intended primarily as a general purpose line. Although this line is designed with four legs, the rounded edges and corners make it very desirable for general use. The absence of center legs allows plenty of foot freedom. The top is of the conventional flat top type with the same grade linoleum as is used on the other two lines. The top is bound with a molded white metal protection strip.

Functionalized for Flow of Work and Efficiency

Making records and having them available constitutes a big part of what is called office routine. "Flow of Work" is the term applied to the efficient handling of this important detail. Those who do the work should be so placed that there is "Line Production," a term just as pertinent to the office as to the factory. Desks and files of various types for specific jobs must be arranged so that workers get the proper advantages of light and air, also so that there will be as little back tracking as possible, thus reducing duplication of effort and simplifying supervision.

When you start to point out changes in office layout to increase efficiency, the graphic picture is necessary. To present these suggestions as vividly as possible, "Y and E," through their sales engineering department, has provided a complete floor planning outfit for presenting a comparison of the old plan and the suggested new one.

This floor planning outfit is simple. It consists of 4 elements or parts, a white sheet with inch scale on all sides to make it easy to draw up a plan of the present floor to one quarter inch scale.

A rough sketch of the suggested new layout is made. The various desks, files, etc., are cut from a sheet of gummed-back cloth showing scaled furniture. On this sheet the pieces are printed to one quarter inch scale. By the aid of a celluloid sheet placed over the old floor plan, the new plan is set up by using the cut out gummed blocks in their new proper work flow arrangement. In this way the advantages of the plans (new and old) are easily compared.

This plan visualizes the exact picture to the management. Should changes be desired, the units may be lifted off and rearranged.

For Brighter, More Liveable, More Productive Offices.

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

. . . OFFICES IN WHICH "Y and E" SERVICES ARE BEING USED BA



ONE of several views showing a large installation of "Y and E" "Style Master" Associate (6900 line) steel desks—part of the general offices of a large national manufacturer. These desks were selected after a thorough survey of steel desks available. Color and design made these desks their first choice.

The non-glare molded linoleum tops . . . warm gracefully rounded outside edges and corners and easy operating drawers were big factors in determining their selection.

The color harmony used throughout the general offices of this company is: Floor covering—marbleized warm tone brown. Walls—warm gray. Ceiling—flat cream. Blinds—cream.

THE offices of this large Public Utility Company are equipped with "Style Master" Associate (6900 line) steel desks. Here is shown a view of one of their Public Relations Offices. Customers come here to discuss service and arrange for contracts. This company has found color harmony a big asset, especially where the public is constantly contacted. The color scheme is pleasing and restful. Floor—two tone gray marbleized, with dark gray feature stripes. Walls—gray blue. Ceiling—same as walls, but much lighter. Blinds—ivory. The "Y and E" Neutra-Tone Gray Associate (6900 line) desks are most pleasing. Chairs upholstered in terra-cotta leather give sparkle and cheerfulness to the business atmosphere.





SPACE is often a greater problem in a large office than in a small one. When a hundred or more desks are to be placed in a given space, every inch counts. In this general office of a nationally known company, "Y and E" "Style Master" Associate (6900 line) steel desks, with their close compact construction and safety features, were most desirable. In offices of this size, color is genuinely important. Surveys show that color harmony reduces fatigue and stimulates concentration and greater effort. Floors—warm tones of browns marbleized. The walls of this and other offices of this company are a warm gray. Ceiling and blinds are flat cream.

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

SED BANKS AND HOSPITALS USE "Y and E" SERVICES—ALSO SCHOOLS



THIS large automobile service and travel club took advantage of the cooperative services of their architect and "Y and E" engineers. The result was the creation of this modern office for their customer relations. The "All Clear Beneath" feature of the 7900 line together with Neutra-Tone Gray finish and rounded top and body corners made these desks desirable for use with the public. The floor is covered with a rich deep rust carpet. The walls are a delightful beige with light tan drapes. Ceiling—an off-white cream. The Kodachrome reproduction here shows only one wing of the office.



THE office of a Vice-President of a large national manufacturing company. The selection of furnishings was made after the architect approved the color and design of "Y and E" "Style Master" Executive (4900 suite).

This office is a large one often used for group meetings and for consultations with customers. Note the "Style Master" Executive (4986) steel desk and the (4939) steel directors table and the (4987) steel book case. Floor covered with two-tone gray twistweave carpet. Walls are walnut flexwood, matched grain, natural finish. Ceiling—flat white. Blinds—light gray. The chair upholstering is an unusually pleasing light blue fabric.

ONE of the general offices of a large national manufacturer; another good example of the practical application of space saving design and flexibility of construction. Those in this office find it more convenient to have the letter drawer of the steel desk at the top of the pedestal. All "Style Master" steel desks have this interchangeable drawer feature. Many of these desks are equipped with transcribing machines in these top drawers. The desks are Neutra-Tone Gray. Floor—gray brown marbleized. Walls—are cream. Ceiling and blinds—light gray tint. Chairs—dark green mohair upholstering.

These six pictures illustrate how the "Y and E" Neutra-Tone Gray finish harmonizes with different color combinations produced by floor covering, wall treatment, drapes, etc.

Why not let us give you the benefit of our experience in planning brighter and more liveable offices.



BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

MODERN STEEL DESKS BY "Y and E" FOR COMFORT AND SERVICE

STYLED EXECUTIVE LINE

THE "Style Master" Executive steel desk and companion pieces (4900 suite) illustrated on the opposite page, are truly Executive quality from the standpoint of color, design and function (harmony, dignity and useability).

The smooth harmonizing linoleum molded top is protected with rounded corner caps and a binding of white metal. This produces a streamlined effect that reduces the appearance of size. Wide Pedestals, which offer better balanced appearance, give added drawer capacity. The extra small drawer at the top of each pedestal is very useful for papers ready for dictation, reports, charts and other important active items. The Card Drawers and large cap size drawers operate on easy running combination ball and pin-bearing cradle type progressive suspensions. These cap drawers are 15½" wide inside and provide 26" of filing space for legal documents or 30" of filing space for letter size papers. The latter is accomplished by the use of an insert which makes the cross filing of two rows of letter size material possible. These desks are equipped with a receding box type base.



4986.1—66x34
Cap width Pedestals

STYLED ASSOCIATE LINE

THE "Style Master" Associate steel desk (6900 line) rounds out the Executive Line for use by Junior Executives and general office use. These desks are modern in design and there is a model available for all requirements.

There are various types of Secretarial and Typists' Models, including the fixed bed and Stow-Away type. All Letter and Cap size Drawers operate on easy running combination ball and pin-bearing cradle type progressive suspensions, and drawer positions in pedestals are interchangeable. The base unit is the island or skid type equipped with four adjustable gliders.

The models illustrated on the opposite page do not cover the entire Associate (6900 line). To better appreciate all the unusual features of this line and to check dimensions to meet specific requirements, send for the "Y and E" complete steel desk catalog.

These desks are adjustable in height to the individual's requirement.



6986.1—66x34
Cap width Pedestals

STYLED GENERAL OFFICE LINE

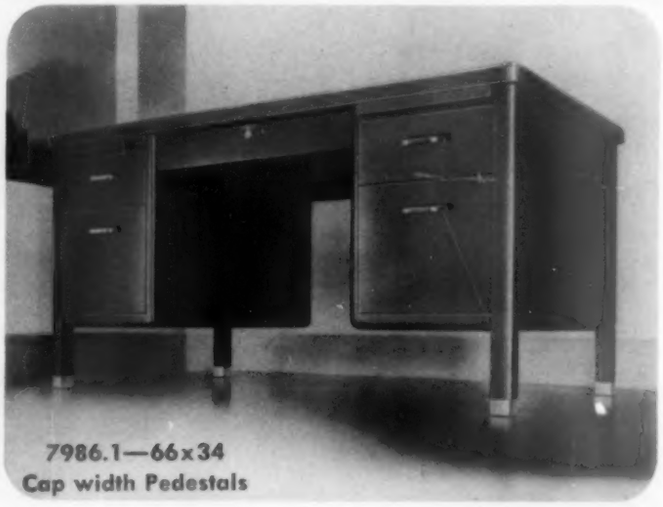
THE "Style Master" Suspension steel desk (7900 line) is a complete alternate general purpose line. This line is extensive, as illustrated on the opposite page.

These desks have four legs with all outside edges rounded to give greater comfort and reduces accident hazards. The conventional type Flat Top with rounded corners is used. The top is covered with the same high-grade linoleum and securely bound with a molded white metal strip for protection.

The utility features, as offered in the Styled Associate Line, are the same in this line.

Cross filing inserts are available for all letter and cap size drawers, an important time savings factor. Contents can be indexed with guide tabs facing the user.

All "Style Master" Steel Desks provide for concealed wiring so that your desk top is always free from exposed telephone buzzer and desk lamp wires.



7986.1—66x34
Cap width Pedestals

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

THERE IS A MODERN DESIGNED "Y and E" STEEL DESK FOR EVERY NEED



4987
Executive Bookcase



49604
Executive File



49204
Executive File "Desk-Hi"



4919
Costumer



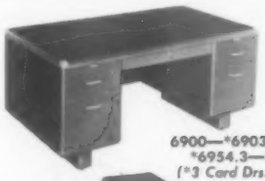
4939
Directors' Table



4966
Companion Table



Y1900
Arm Swivel Chair



6900—*6903—60x34
*6954.3—55x34
(*3 Card Drs. L. Ped.)



SP6950.3—50x341 Cap Dr.
6921—45x341 Let. Dr.



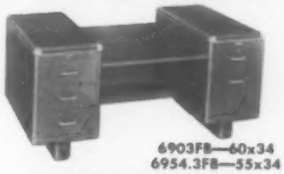
6900RT and LT—60x34
*6904LT and RT—60x34 Card Drs.
*6954.3LT and RT—55x34 Card Drs.
(*3 Card Drs.)



6957—60x34
(For Calculating Mch.)



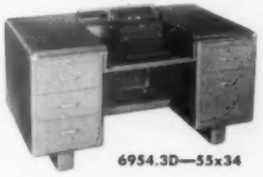
6942.3FB—42x34



6903FB—60x34
6954.3FB—55x34



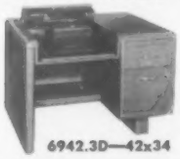
6966—66x34
6934—60x34



6954.3D—55x34



6937—72x34

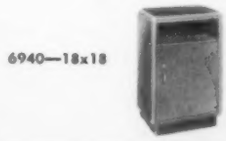


6942.3D—42x34

6954.3LT or RT—55x34

The Stow-Away type of secretarial steel desk with provision for typewriter in either left or right pedestal.

To stow away typewriter—lower front of hinged typewriter platform. When folded down, it will easily ride into pedestal. Advantage — saves office space.



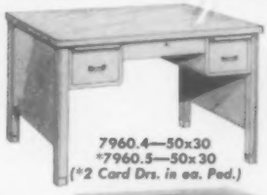
6940—18x18



*7900—60x34
7903—60x34
7953.3—50x34
7951.3—50x30
(*1 Cd. and 1 Let. Dr. in ea. Ped.)



7921—45x34
*7923—45x34
(*3 Card Drs. in R. Ped.)



7960.4—50x30
*7960.5—50x30
(*2 Card Drs. in ea. Ped.)



*7900LT—60x34
*7900RT—60x34
7904LT and RT—3 Cd. Drs.
(*1 Card and 1 Let. Dr.)



7903D—60x34
7953.3D—50x34



7923D—45x34



7903FB—60x34
7951.3FB—50x30



7923FB—45x34



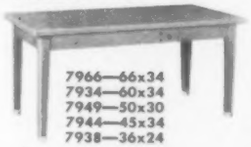
7955—45x30



7925—36x24



7937—72x34
(Two Drawers)

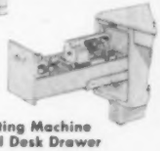


7966—66x34
7934—60x34
7949—50x30
7944—45x34
7938—36x24



7940—20x17

All Letter and Cap drawers of "Style Master" Steel desks can be equipped to house any of the dictating machines. Electric contact is broken when drawer is closed. Illustrated at right.



Dictating Machine in Steel Desk Drawer

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

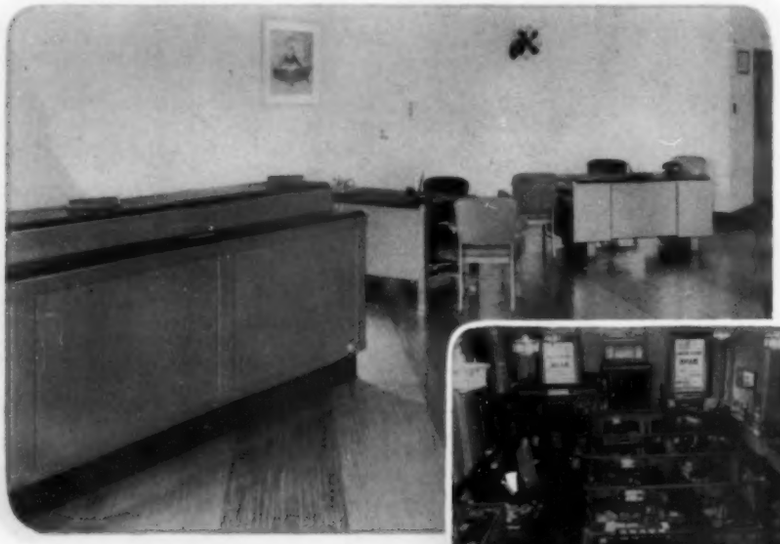
AGENTS AND DEALERS EVERYWHERE

"Y and E"

EMPIRE FILES ONE, TWO, THREE, FOUR AND FIVE DRAWERS

STREAMLINED COUNTERS

The Modern Counter is made of FILES



Counter files is the name given to all three drawer (cap and letter) height files. They are 41 3/16" high and when any combination of these files is placed together, they form a practical counter at a height that provides comfortable working or consulting space. Separate tops and backs finish these counter files to meet any requirement and allow unobstructed view of the office. The counter illustrated is the latest streamlined molded top type, same as used on Executive and Associate desks. This counter creates an attractive inviting atmosphere for the public who transact business over it.





The before and after illustrations at the right show the solution to what appeared to be an expansion problem. A bank was about to enlarge its quarters because there was no longer sufficient space for their customers. Here again cooperative service between the architect and "Y and E" brought about a very satisfactory result, in the same space.

SPACE SAVING—*Before and After*

The illustration below is an example of how five-drawer files are used to advantage—note the counter files forming an aisle through the center. Where space is a factor and four-drawer files are in use, congestion can be relieved by placing one-drawer files on top.



YAWMAN AND ERBE MFG. CO.

Factories and Executive Offices: ROCHESTER 3, N. Y.

Branch Offices and Stores

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WASHINGTON
SALES OFFICE:
ALBANY, N. Y.

Write for Catalog of Steel Desks and Files

C-O-TWO FIRE EQUIPMENT COMPANY

Newark 1, New Jersey

SALES AND SERVICE IN ALL PRINCIPAL CITIES AND IN CANADA

Carbon Dioxide Fire Extinguishing Equipment

IT'S SAFER because IT'S FASTER

C-O-TWO carbon dioxide fire equipment is particularly adaptable for the protection of cafeterias, domestic science kitchens, manual training, woodworking, electrical, machine shops, laboratories and wherever flammable liquids are used or stored. C-O-TWO gas kills fire in seconds without damage to materials or equipment.

C-O-TWO KILLS FIRE — SAVES LIFE!

WHAT IS C-O-TWO?—Carbon Dioxide is a clean, pure, dry, odorless and non-damaging inert gas. It is the fastest and most efficient of modern fire extinguishing agents.

C-O-TWO Extinguishers smother fire instantly under a heavy, dense, blanket of Carbon Dioxide Gas. One of Carbon Dioxide's most valuable properties is its high ratio of expansion (450 to 1). When liberated, the gas is discharged under its own pressure without pumping and by the force of its own expansion it penetrates every nook and corner, even seeking out cracks and crevices where fire might lurk. It reaches all out-of-the-way places which cannot be reached by other extinguishing agents. It is equally effective when used indoors or outdoors, and is not affected by temperature and does not deteriorate.

Carbon Dioxide will not damage or injure machinery, equipment, woodwork, finishes, fabrics or materials with which it may come in contact. It is a non-conductor of electricity, which is an added safety feature to fire fighting.

The design of C-O-TWO equipment eliminates any possibility of freezing in cylinders, valves, discharge hose, horn, nozzles or piping.

Carbon Dioxide has many commercial uses, and C-O-TWO refills are obtained quickly and conveniently from direct factory branches and recharging plants located in practically every large city and seaport throughout the world.

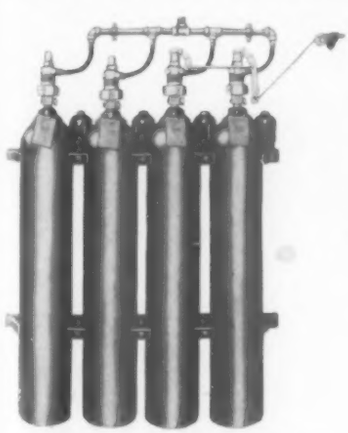
WHO IS C-O-TWO?—"C-O-TWO" is the registered trade mark and corporate name of this company. Specializing for many years in the development of carbon dioxide fire extinguishing equipment, this company has committed itself to a policy of maintaining a position of superiority in quality, workmanship, design and operation which merits careful consideration in the selection of your fire extinguishing equipment.



WHEELED TYPE
50 to 100 lbs.
(Net Gas Contents)

The high standard of C-O-TWO equipment is further assured by the rigid tests and unqualified approval of the Underwriters' Laboratories, Factory Mutual Laboratories and all Federal Bureau.

To be safe, specify "C-O-TWO" and this company's name when ordering



MANUAL AND AUTOMATIC SYSTEMS

C-O-TWO PORTABLE EXTINGUISHER

The new and improved C-O-TWO "Squeeze-Grip" type of valve for hand portable extinguishers is another of C-O-TWO's contributions to fire protection.

The C-O-TWO "Squeez-Grip" valve has a "pressure-closing seat," which is closed against leakage by the tremendous pressure of carbon dioxide within its own cylinder.

Opening and closing of a "hand-wheel" type portable is a slow operation when compared to a "Squeez-Grip" type. First the portable is set down and the hand-wheel is turned to the open position which discharges carbon dioxide before the portable is picked up. It is also necessary to set the portable down to close the valve.

There is no need to set a "Squeez-Grip" portable down as the valve is easily opened or closed while carrying the extinguisher. The valve is opened just as fast as you can close your hand as there is nothing to do but squeeze the release lever over the carrying handle.



PORTABLE
SQUEEZ-GRIP
4 to 15 lbs.

So simple a woman can operate it. It is as easily operated as closing your fingers

The "Squeez-Grip" type extinguisher is more efficient than a hand-wheel type as there is no "loss of gas" or "time" while maneuvering around a fire.

Wheeled portables are furnished with seat and disc type valves.

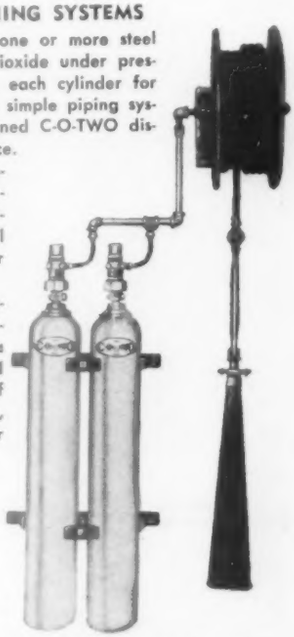
All C-O-TWO valves are fitted with recoil preventors and have a separate side safety or pressure relief disc.

C-O-TWO FIRE EXTINGUISHING SYSTEMS

The C-O-TWO system consists of one or more steel cylinders filled with liquid carbon dioxide under pressure; a discharge head attached to each cylinder for quickly releasing the contents and a simple piping system terminating with specially designed C-O-TWO discharge nozzles in the protected space.

Several types of manual or automatic releases are available for actuation of C-O-TWO systems. All C-O-TWO systems are arranged for manual operation by local manual control or by remote manual control.

Two or more spaces can be protected with a single system by flooding all spaces simultaneously, or a number of spaces may be protected with one group of cylinders, by use of C-O-TWO direction or selector valves, for direction of gas into the proper space.



FIXED HOSE REEL TYPE

TRADE C-O-TWO MARK

HOTCHKISS

Dept. U, Norwalk, Conn.

"Pioneers in All That's Best in Stapling"

Hotchkiss Staplers Prove Their Value in Classroom and School Office

Classroom papers and business forms can be classified and organized better with them. Stapled papers occupy less space in file drawers. Staples require less wire and are economical to use. Hotchkiss staplers are made to stand hard usage and have given years of service in many schools.

HOTCHKISS Model 122P Stapler and Tacker



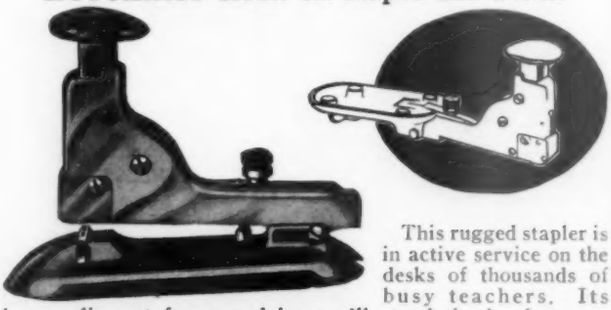
Here is a handy, double duty stapler and tacker that is small enough to fit in purse or pocket or it can be kept in a corner of the desk drawer. To staple papers, just squeeze it like a plier. It holds 105 economical standard size staples, the same size as are used by most of the larger desk models.

By swinging the base down and around it becomes a useful light duty tacker. Teachers like them for tacking up papers, for pinning drawings on drawing boards and hundreds of other uses.





HOTCHKISS Model 6A Stapler and Tacker



This rugged stapler is in active service on the desks of thousands of busy teachers. Its heavy, die-cast frame and base will stand the hardest use. The capacity of Model 6A is 105 Standard Size Staples and it is fitted with a duplex anvil which permits fastening papers with a permanent clinch or with the Hotchkiss exclusive temporary clinch. The latter type permits the staple to be removed like a pin with the fingers—a very handy feature.

The base may be swung down and locked back so as to use the machine for tacking papers and drawings to walls and drawing boards. Rubber feet in the base prevent scratching desks. Finished in handsome black crackle lacquer.

CHISEL-POINTED TRADE-MARK

HOTCHKISS Chisel-Pointed Staples

For Easy Stapling

These staples have keen chisel points and penetrate material easier than ordinary blunt pointed ones. They are made of correct gauge wire to micrometer exactness and fit the machines perfectly.

Have your local Hotchkiss Stationer or Wholesaler show them to you or write Hotchkiss direct. The Hotchkiss Guarantee is your protection.

ART METAL CONSTRUCTION CO.

Jamestown, New York

BRANCH OFFICES

Cincinnati, Ohio
Baltimore, Md.
Chicago, Ill.
Hartford, Conn.
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Boston, Mass.
New York City, N. Y.
Detroit, Mich.
Pittsburgh, Pa.
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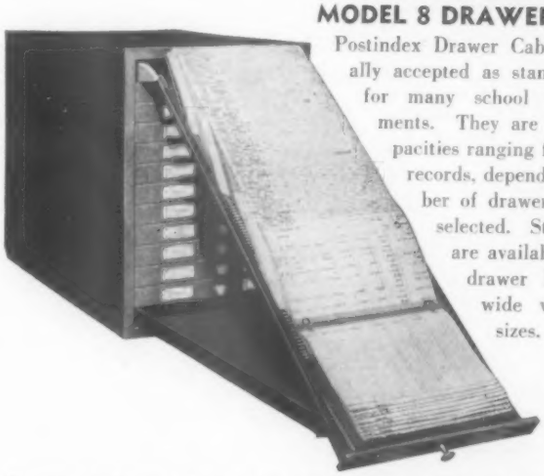
SALES AGENTS IN ALL OTHER PRINCIPAL CITIES

In the following pages we show a functional application of the products and services of the Art Metal Construction Company, to modern school building situations. For the administrative office, there are modern desks, tables, bookcases and Postindex visible index files. For the library, laboratory, shop, lecture rooms and store rooms, there are functionally correct tables, cases, work tables, cabinets and other furniture—all of metal and built to Art Metal's regular high standards.

Architects and educational executives are invited to make use of our consulting staff in the planning of school administrative offices, libraries and other departments.

POSTINDEX VISIBLE INDEX FILES

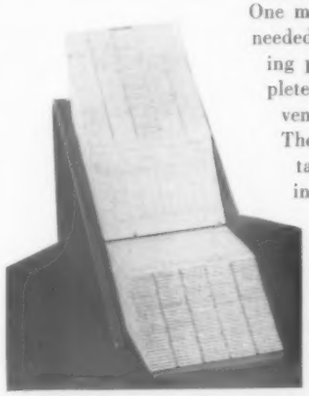
MODEL 8 DRAWER CABINETS



Postindex Drawer Cabinets are generally accepted as standard equipment for many school record requirements. They are available in capacities ranging from 500 to 2500 records, depending on the number of drawers and card size selected. Standard cabinets are available in 13 and 20 drawer heights, and a wide variety of card sizes.

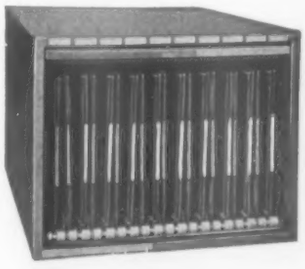
The trays holding the individual records are quickly and easily removed from the cabinet for reference or posting at some other location. Because of their unique suspension on Postindex trunnion wires, Postindex records can be instantly removed from the tray or their position in the tray changed. Standard trays have an average of 90 4-page records per tray.

VERTICAL INDEX FILE



Designed for jobs requiring exceptional speed in posting. Fast posting is easy because as many as 300 indexed cards are in view approximately at eye level. One movement brings the card needed to the horizontal posting position where it is completely in view and in convenient writing position.

The standard card holders take two cards each, one in front and one in back. Cards have celluloid index label holders and can be adapted to a wide variety of uses, such as inventory, cost, student rosters, etc. The tray is easily removed from the stand for executive attention at some other point or for more compact storage.

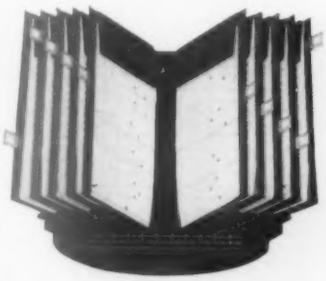




MODEL 5 FLAT BOOKS AND CABINETS

Model 5 Postindex Flat Books are widely used among school administrators. They are readily adapted to either large or small installations, are compact and convenient to handle. They lie flat on the desk and are very easy to post. An average Flat Book holds 140 4-page records. The books provide a fully protected record unit which may be carried to any part of the building. Books are made of aluminum and are very light. They may be purchased one at a time or in complete installations.

POSTINDEX PROGRAM ROTARY STAND



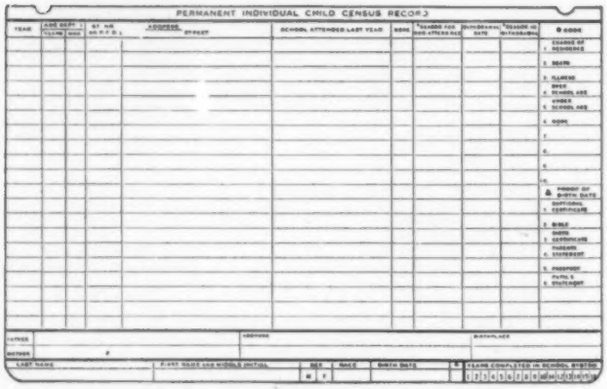
In junior and senior high schools, and in all other schools having the departmental type of organization, it is desirable to have the daily program of each pupil easily available.

The Postindex Program Rotary Stand provides for the visible indexing of each child's daily program. Each panel is doubly indexed for quick reference.

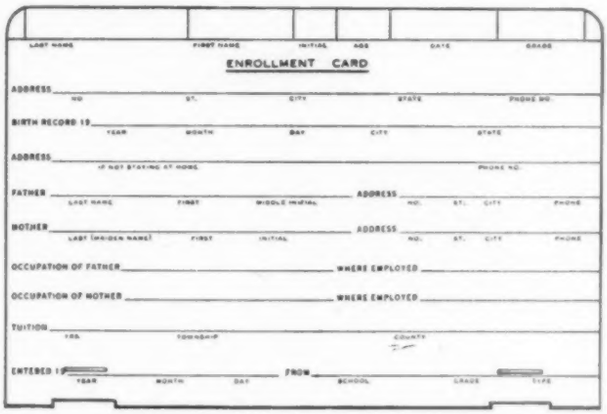
Individual panels may be easily removed. The sloping standard which holds the panels is mounted on a rotating base, which makes it easy to refer to the records from either side of a desk or counter.

For additional information, write POSTINDEX DIVISION, ART METAL CONSTRUCTION CO., Jamestown, N. Y.

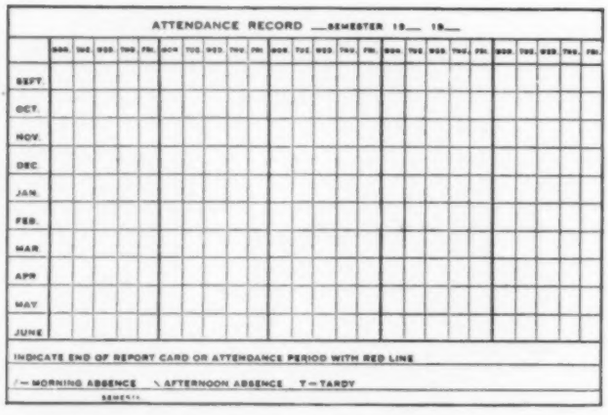
Typical School Records from the POSTINDEX Library of Forms



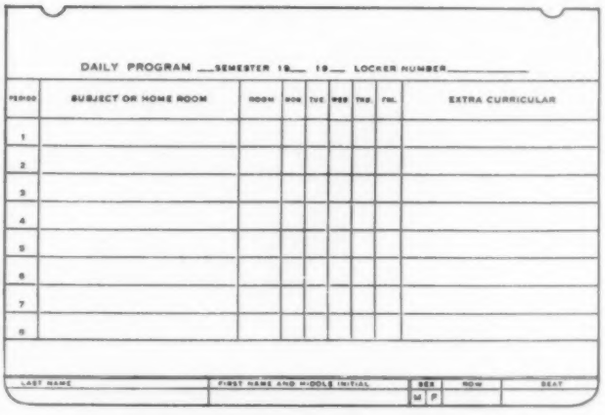
Postindex form 81-C-6385-8. This shows one side of a two-page card which incorporates complete census information and attendance information. The back of this card shows history of employment



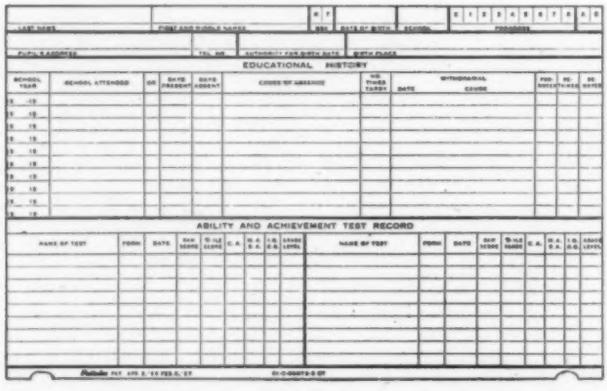
Postindex form 81-B-2916-8P. This is a two-page form with illustration showing the enrollment record. The back of this same card covers daily program record



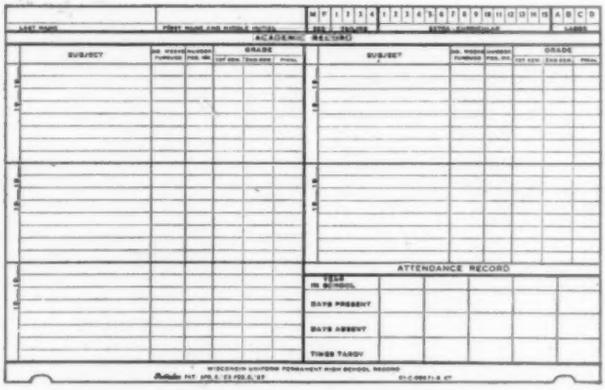
Postindex form 81-B-2922-8. This is an insert form which may be filed with the individual pupil cumulative record. The side illustrated shows attendance record for a year. The back of this particular form has a daily program record



Postindex form 81-B-2913-8. This is a four-page form giving the daily program for a student. The other pages are devoted to registration information and attendance



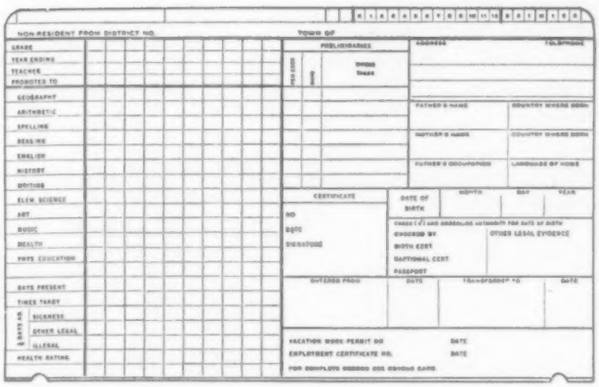
Postindex form 81-C-06072-8CT. This illustration shows one page of a four-page form covering educational history, ability and achievement test record. The other three pages provide for scholarship record and health information



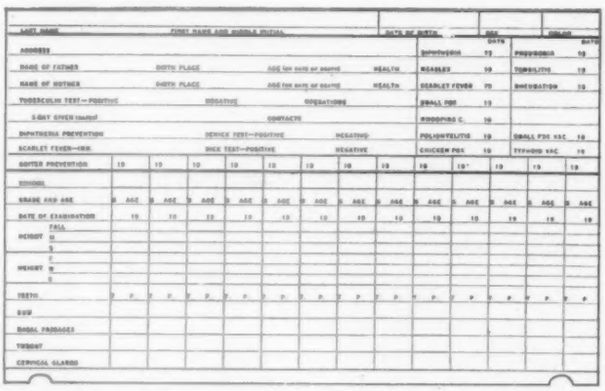
Postindex form 81-C-05971-8CT. This illustration shows one page of a four-page form with academic record and attendance information. The other three pages provide for general information, extra-curricular activities, achievements, with space for intelligence and achievement tests

For additional information, write POSTINDEX DIVISION, ART METAL CONSTRUCTION CO., Jamestown, N. Y.

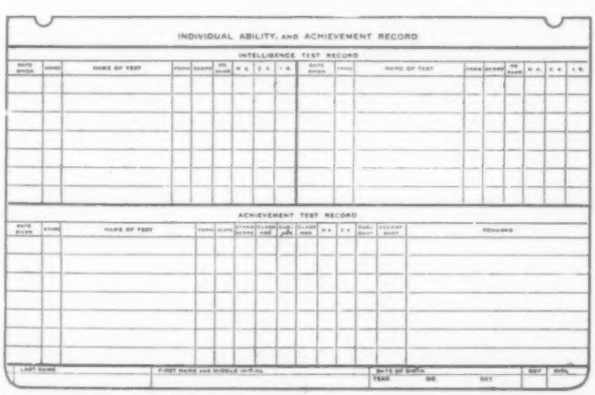
Typical School Records (Cont'd)



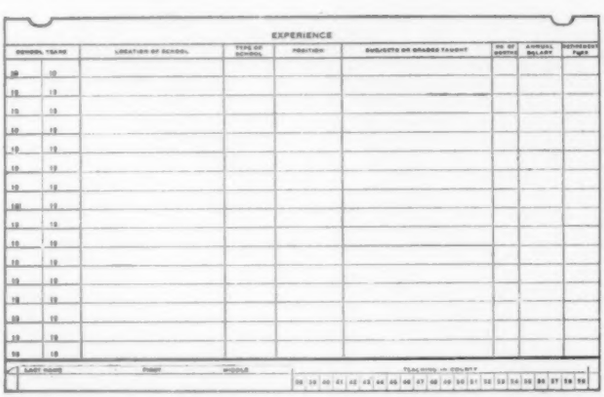
Postindex form C-4077-P. This is a four-page form showing the Elementary scholastic record. One of the other pages covers scholastic record for Junior and Senior High School while the other two pages provide space for recording pupil activities, guidance facts, intelligence and achievement tests



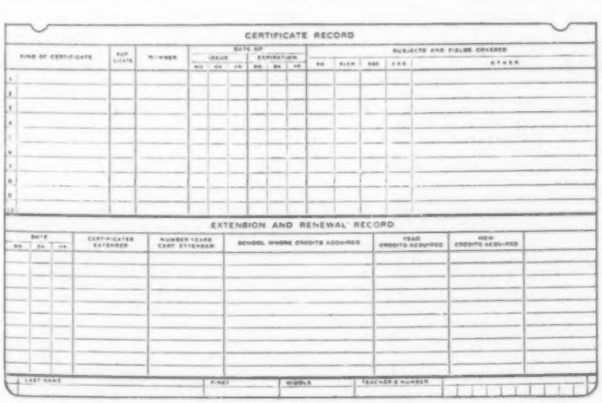
Postindex form 81-C-06121-8CT. This is a four-page record showing a portion of health history. The other three pages are devoted to a continuation of the same record



Postindex form 81-C-6387-8. The illustration shows front covering intelligence tests and achievement tests. The back is a continuation of achievement tests



Postindex form 81-C-06112-8CT. This is a four-page record showing data on teacher's experience. The other three pages are devoted to personal information, educational background, special training and certification, health and general remarks



Postindex form 81-C-6370-8. This is a four-page record of teacher's certification, extension and renewal record. The other three pages are devoted to experience, training and general information



Postindex form 96-C-5740-14. This is a four-page form for recording State Aid data. The other three pages provide record in regard to statistical information, census, enrollment and teachers

For additional information, write POSTINDEX DIVISION, ART METAL CONSTRUCTION CO., Jamestown, N. Y.

Art Metal School and Administrative Office Equipment

ART METAL AIRLINE DESKS

Art Metal Airline Desks give the utmost in desk value—"Artolin" tops, cast aluminum drawer pulls, adjustable footings, easily working and conveniently arranged drawers. Only a manufacturer with Art Metal's facilities could put a desk of this quality on the market at the price. Thirty styles and types of desks and tables for all school office work are available. Write for catalog.



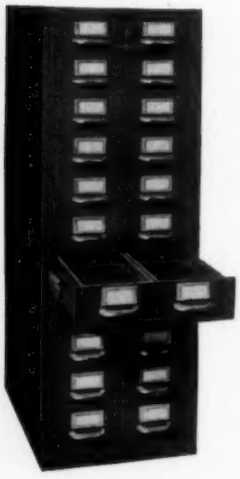
Airline Secretarial Desk



Airline Executive's Desk

Office desks of modern design originated by Art Metal, they have "island bases" with adjustable footings—instead of legs; easy to clean around. Are finished in silvery gray, conserving light in the office. Desk tops are of gray "Artolin" which makes for better seeing by reducing brightness ratio between desk top and work.

Art Metal Cabinets

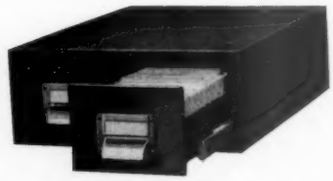


ART METAL VERTICAL FILES

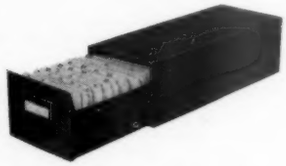
Style 76C44 is typical of the Art Metal line of standard files made in a complete range of heights from one to five drawers and in units for all standard sizes of office papers and cards.



Art Metal Storage Cabinets for all storage purposes come in single and double door widths. They may be had in desk heights and also with wardrobe fittings.



ART METAL Card Index Cabinets for smaller card record systems or individual use. Each cabinet is an individual unit but additions added as system grows can be fastened to it. For card sizes 5″ x 3″, 6″ x 4″ and 8″ x 5″. All Cabinets 18″ deep outside.

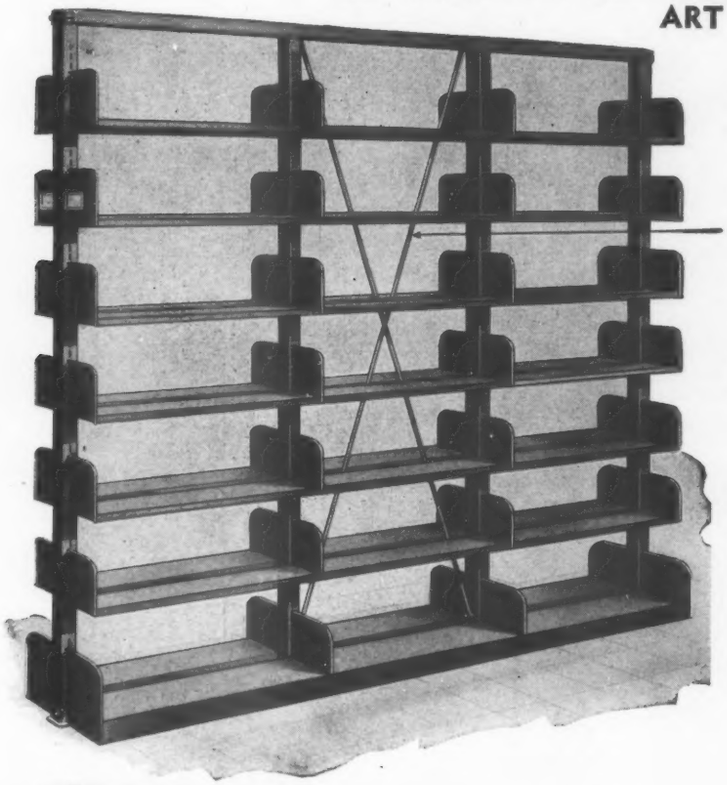


ART METAL Single Drawer Card Index Trays are a great convenience for small record systems. Easy to handle and refer to. May be placed on desk, always ready for use.

For additional information, write ART METAL CONSTRUCTION CO., Jamestown, N. Y.

Art Metal for the School Library

ART METAL "UNITYPE" BOOKSTACKS



UNITYPE Bookstacks are available in two styles: Free-Standing Stacks and Top-Braced Units. Both models may be had single or double-faced. Write for booklet.

The TOP-BRACED bookstack is recommended for locations where it is undesirable to use floor fastenings. Top bracing makes floor fastening unnecessary.

ART METAL EQUIPMENT for LIBRARIES includes

Standard Type Book Stacks	Vertical Files
Bracket Type Book Stacks	Stairs and Railings
Bracket Type Rolling Book Stacks	Booklifts
	Card Catalog Files
Charging Desks	Reading Tables
Magazine Racks	Book Trucks

FREE-STANDING UNIT—DOUBLE-FACED

Each double-faced section contains 2 closed base shelves 10″ deep, center dimensions; 12 shelves, adjustable 1″ on centers, 8″ deep, center dimensions; stack 90″ high overall. Each unit must be securely fastened to floor.



FREE-STANDING UNIT—SINGLE-FACED

Each single-faced section contains 7 shelves adjustable 1″ on centers, stack 90″ high overall, 8″ deep, center dimension. Must be fastened securely to floor.



Detachable shelf label holders are available for the square front shelves.



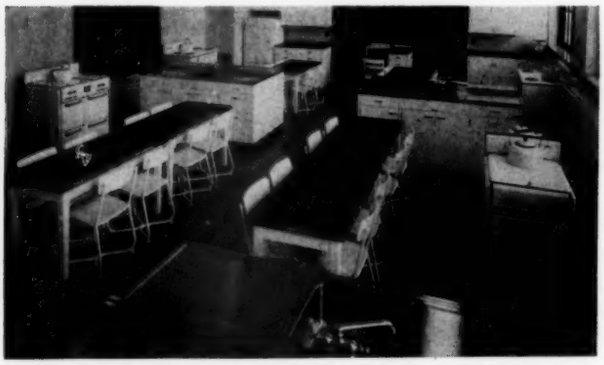
BOOK SHELF UNITS

This is the famous Space-A-Shelf unit using the Art Metal library shelf adjustment principle. Detachable end panels are used to save space in batteries of units — especially suitable for schools.

For additional information, write ART METAL CONSTRUCTION CO., Jamestown, N. Y.

Art Metal Equipment for the Home Economics Department

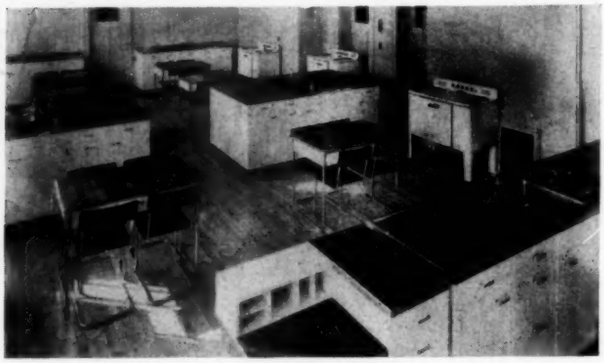
Art Metal equipment is in use in the Home Economics Department of many leading schools. Four typical installations are shown here. We shall be glad to submit recommendations to any school interested in new equipment.



Art Metal Equipment in a Central School in the Mid-west



An Eastern High School Home Economics Department

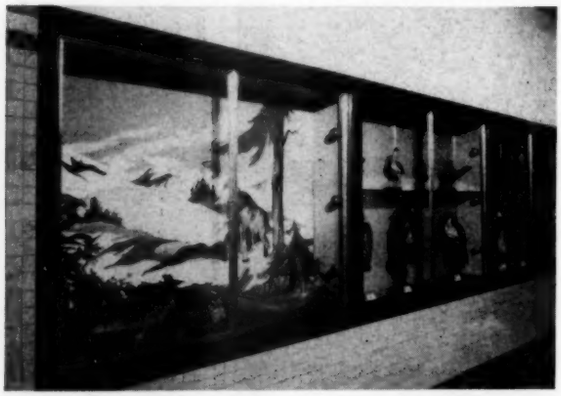


Another Art Metal High School Installation

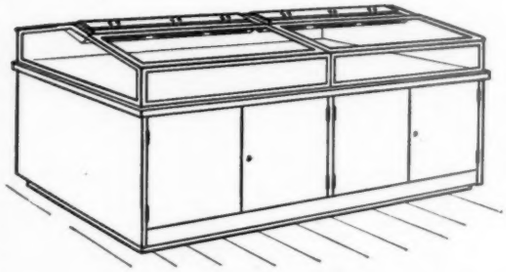


A Central School Home Economics Department in Minnesota

Art Metal Exhibit and Display Cases



Art Metal offers a variety of cases for displaying educational exhibits, museum specimens, students' work and trophies. All Art Metal exhibit cases are made of extruded bronze shapes formed into dust-tight construction.



SLOPE TOP CASE. Equipped with double-faced lights through center.



RECESSED WALL CASE. Semi-indirect lighting emanates from behind central pilaster. Has sliding doors. Can be furnished with doors hinged at top or side and also with removable panels if desired.

CABINET TYPE CASE WITH SHELVES. Glass or solid backs optional.

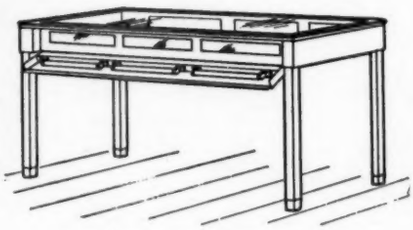
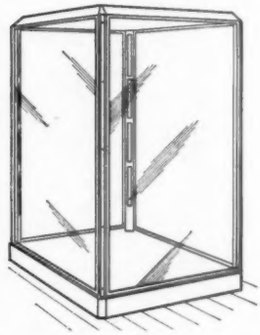


TABLE TYPE CASE. Lights in the sides. Shown with lighting panel open for access.



FREE STANDING CASE. Lights in each corner section.

For additional information, write ART METAL CONSTRUCTION CO., Jamestown, N. Y.

SNEAD & COMPANY

FOUNDED 1849

Designers, Manufacturers, and Erectors of Library Bookstacks and Metal Partitions

Sales Office: 108 Pine Street, Jersey City, N. J. *Main Office and Plant:* Orange, Virginia



Since 1849, the Snead symbol of lasting beauty, quality and progress in metal construction

The design and construction of a modern, efficient library require the services of specialists. Bookstack construction cannot, from its very nature and use, be confined within strict limitations as to design and plan. But there are certain rules to be observed if good planning and economy in cost are to be achieved. Consultation with Snead engineers from the stage of sketch plans through to the completion of the contract will save time for the architect, the owner or the building committee, and prevent costly, often irreparable mistakes.

Snead & Company pioneered the development of metal bookstacks and library equipment. It is a tribute to the creative ability of Snead engineers that so many of their progressive ideas have become standard library practice, and that so large a proportion of the world's great libraries are living monuments to their creative skill.

Snead & Company designed and built the metal bookstacks for the original Library of Congress almost 50 years ago. Prior to that Snead & Company had been manufacturing metal products for 47 years. Thus the Snead tradition of quality and progress in metal construction goes back almost a century. Today, we believe, this company is the largest producer of metal stack equipment in the world.

We will gladly recommend the most satisfactory type of construction for each individual requirement. Since we make all types of bookstacks and are not partial to any one, we are in a position to offer unprejudiced advice. We have complete facilities for taking charge, under one contract, of every item necessary to equip the stackroom of the modern library, including many exclusive Snead features such as continuous deck floor construction, convertible stacks, rolling cases, zig-zag ventilation, book distributors, hinged bracket shelves, stack carrel units, stack aisle light reflectors, and the well-known Snead Mobilwalls which combine permanent appearance of fixed masonry walls with instant mobility and flexibility for enclosures such as classrooms, seminars, offices, etc.

The less costly types of Snead Shelving can be purchased from stock for small libraries, law offices, business offices, and bookstores, in small units designed to be added to as the need arises.

Whether you are planning an entire new library, a rearrangement, or even the simple addition of a few sections, it will pay you to consult us. No obligation. Our development department is constantly trying to crystalize the progressive thinking of the leading bookstack authorities. Our latest model, a full size, two story library building, on the modular system, is open for your inspection on our premises at Orange, Va.

PRODUCTS OF SNEAD & COMPANY

Bookstacks
- Single and multi-tier
- Modular Construction

Stack Accessories
- Range Finders
- Card Frames
- Book Supports
- Shelf Label Holders
- Stack Aisle Light Reflectors
- Newspaper Stacks
- Book Distributors
- Study Carrels
- Sloping Sorting Shelves
- Movable Work Desks
- Sliding Reference Shelves

Mobilwalls—Steel Partition

LIBRARY CATALOG

The Snead Bookstack Catalog contains valuable library and stack data. Photographs and floor plans illustrate various types of libraries equipped with Snead Bookstacks and other products, as planned for in cooperation with architects and librarians. The book also discusses and illustrates the solution of problems relating to such topics as, Procedure and Planning, Shelving for Small Libraries, Special Purpose Shelving, Communication Between Stacks, Stack Floors, Stairs, Ventilation, and Lighting. A request on your business stationery will bring you this valuable book and other data at our disposal dealing with your individual library problem. Write for it today.

THE GLOBE-WERNICKE CO.

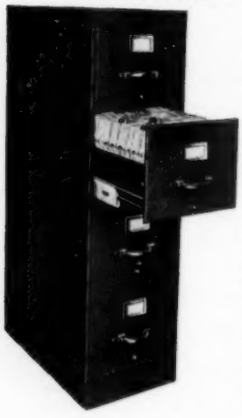
Norwood, Cincinnati 12, Ohio

Makers of Outstanding Steel Equipment, Quality Filing Supplies and Systems, Useful Office Aids

TODAY, schools and universities are carrying the heaviest administrative load in the history of education. It is therefore more important than ever to equip the office with business tools that will speed up and simplify procedure. Such tools are the business of The Globe-Wernicke Co. which has had more than 60 years' experience in this highly specialized field. Only a few of this company's many famous products can be shown here, but your Globe-Wernicke dealer will be glad to give you every assistance in selecting attractive, sturdy, dependable equipment to fill your needs. If you prefer, you may write to the company.

★ ★ ★

GLOBEART STEEL FILES



Smartly modern in design, these famous cabinets are engineered for lasting service and quiet, easy operation even when filled to capacity. High grade materials are used throughout. Each drawer is equipped with ball-bearing progressive extension slide and automatic catch. Available in 2-, 3-, 4-, and 5-drawer styles, letter and legal sizes. Can be fitted with inserts for cards, checks, or documents. Finished in green, seal gray, or walnut or mahogany grain. Send for FREE circular.

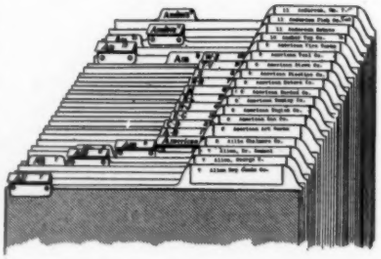
HORIZONTAL STEEL SECTIONS



Ease and flexibility of intermembering make these sections the answer to countless filing problems. From a wide selection of units for office and library, you can choose a tailor-made group to fit your current needs; it can be expanded and adapted to meet later requirements. All sections are made of high quality furniture steel and embody many construction features that assure strength, rigidity, durability, convenience, and economy. May be had in green, seal gray, or walnut or mahogany grained finish.

SAFEGUARD FILING SYSTEM

So completely simple and practical that the newest clerk can file papers accurately, find them quickly; so adaptable that it can be expanded from a single drawer to a hundred cabinets without major change.



FREE! "Find-i-tis", the popular and authoritative booklet on correct filing procedure. Write for your copy now.

STEEL VISIBLE RECORD EQUIPMENT

Send for FREE information-packed circular

Actual time studies show that Globe-Wernicke Visible Record Equipment can save up to 33¾ minutes out of every hour spent in finding and refiling card records. You pull out a tray and the cards are visible for swift identification; flip up the one you want—it stays put so you have both hands free to jot down notes or make entries. Cards are easily removed and replaced, yet can't come loose till you release them.



ANGULAR CELLULOID TAB GUIDES



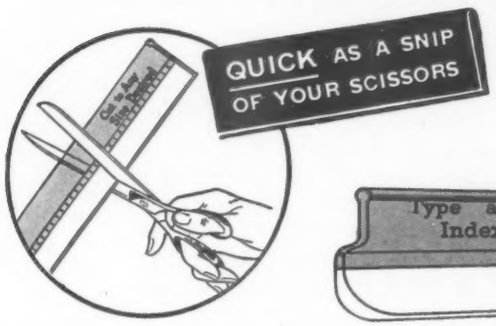
They look you in the eye—make filing and finding quicker and easier. No metal to obstruct view of the tab. Long-lasting because tab *gives with the guide*. Exclusive construction carries pressboard shoulder to top of tab for extra strength. Rounded corners on guides prevent dog's-ears.

ALL TYPES OF STOCK AND SPECIAL FORMS AVAILABLE

Wide application of Globe-Wernicke Visible Records has enabled us to collect a tremendous variety of stock forms. To meet special needs, our Records Engineers will be glad to design and supply you with special forms.

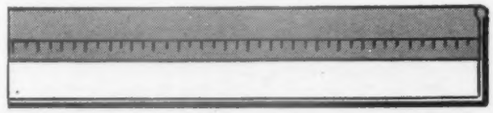
"U-MAK-A" INDEX TABS . . . Put Facts at Your Finger Tips!

Made of heavy celluloid with cloth skirt. The beaded edges give an easier grip, and greater strength.



Key your catalogs, directories, text books . . . quickly, easily, inexpensively. Attractive selection of bright colors.

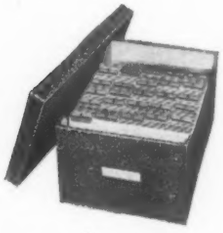
Shield Type is ready-made in four handy sizes—5/8", 1", 1½", and 2"—all with 3/8" tab projection.



Strip Type has built-in measuring scale for quick accurate cutting.



Indexed Type has letters printed directly on the celluloid; two sizes: ¼" x ¼" and 3/8" x ½"; green only.



AGATE CARD INDEX TRAYS

Thrifty and practical, stout construction for long service. Removable lid is dust-proof. Follower block on counter-sunk rod keeps cards upright. All standard card sizes and check size.



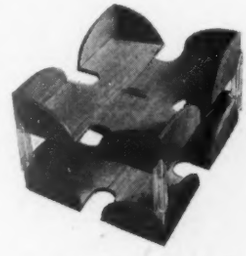
BOX FILES

Popular for current letters, bills, and invoices. Students and writers like them for lecture notes, reports, and manuscripts. Indexed A to Z or 1 to 31. Choice of snap or suitcase lock.



EVERY DAY FILES

For sorting papers and organizing work, this patented office aid is now handsomely restyled in rich blue linen-weave fabric printed in silver and black, with high-visibility gray tabs. Wide selection of indexing.



ACCESSO WOOD DESK TRAYS

Wide cut-outs make them handy to reach from all sides, eliminate digging for papers. They may be stacked to any desired number of decks for incoming and outgoing mail and for routing papers to files or to various departments.

GLOBE-WERNICKE'S WORLD-FAMOUS SECTIONAL BOOKCASES



Superb wood, skillfully worked by master craftsmen in designs of classic simplicity has made the Globe-Wernicke Sectional Bookcase an attractive furnishing for home, school, studio, or library. Its functional utility has won world-wide fame. Timeless in pattern and enduring in construction, many have passed the half-century mark in active use. Never too large or too small for your needs. You buy only the sections you require, add more as your library grows. Dustproof glass doors glide silently over the tops of the books. Available in fine natural woods and in imitation walnut or mahogany.



Send for FREE Literature

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NATIONAL CASH REGISTER CO.

Cash Registers · Adding Machines · Accounting–Bookkeeping Machines
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CASH REGISTERS · ADDING MACHINES
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modern business demands mechanized business training...



In order to simplify today's complicated office traffic, modern business requires more and more business machines. Speed, skill and efficiency in operating these machines have become prerequisites for a good office position.

Give your students the training they deserve. Develop their operating skills on the office machines most used in today's business.

In every phase of business and industrial accounting, there are National machines and systems. Their simplicity of operation and time-saving efficiency make them right for every office, regardless of the size or nature of the business.

Use National machines in your training system. Render your students, and the business enterprises in your community, the service of solid, practical training in developing business machine operating skill.

Call your local National representative for information, or write The National Cash Register Company, Dayton 9, Ohio.

REMINGTON RAND INC.

315 Fourth Avenue, New York 10, N. Y.

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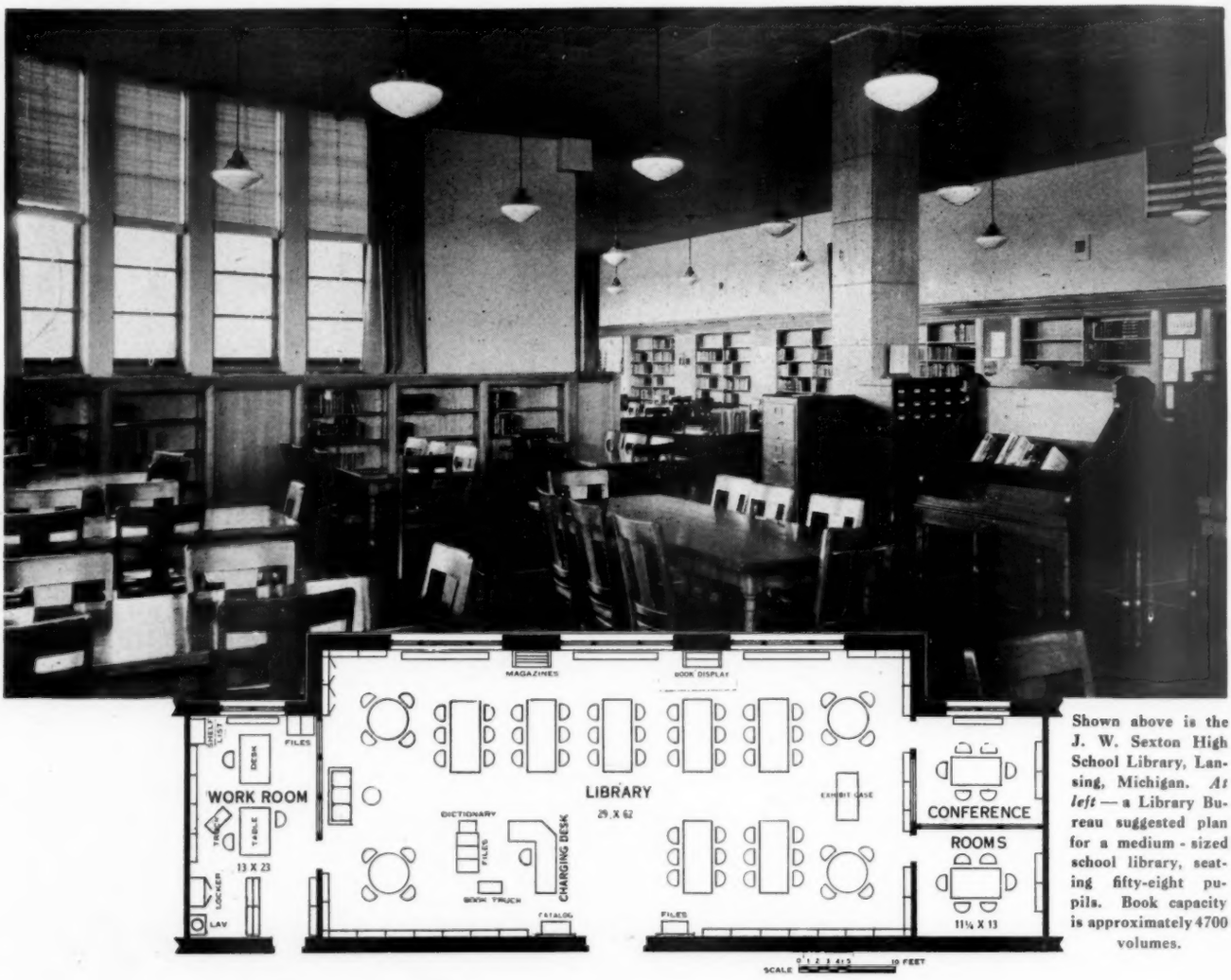
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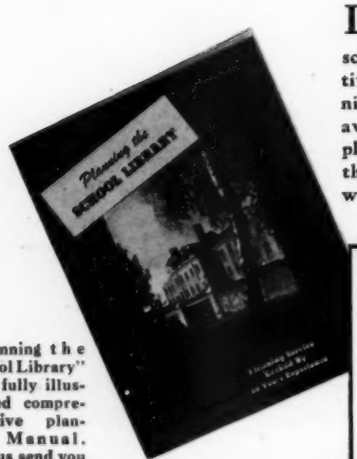
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Shown above is the J. W. Sexton High School Library, Lansing, Michigan. *At left* — a Library Bureau suggested plan for a medium-sized school library, seating fifty-eight pupils. Book capacity is approximately 4700 volumes.

LIBRARY BUREAU'S sixty years of skill in producing specialized equipment for school libraries is evidenced by the attractiveness, utility, and completeness of the furniture and operating facilities that are now available to the librarian. A comprehensive planning service is offered by Library Bureau that assists in blending functional design with the "hearthstone warmth" so important today. The scope of this service extends from the layout of the library itself to the detailed planning of equipment. Architects and school executives find they receive valuable aid in planning a new library or in expanding the present facilities by consulting Library Bureau. This service is offered without obligation, of course. Simply write to our nearest Branch Office.



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LIBRARY BUREAU DEPARTMENT

Remington Rand

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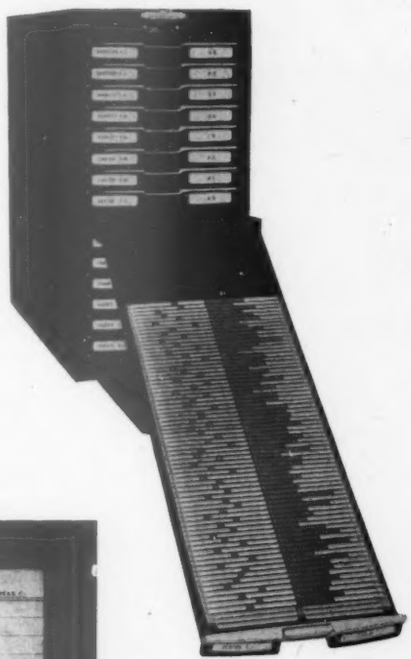
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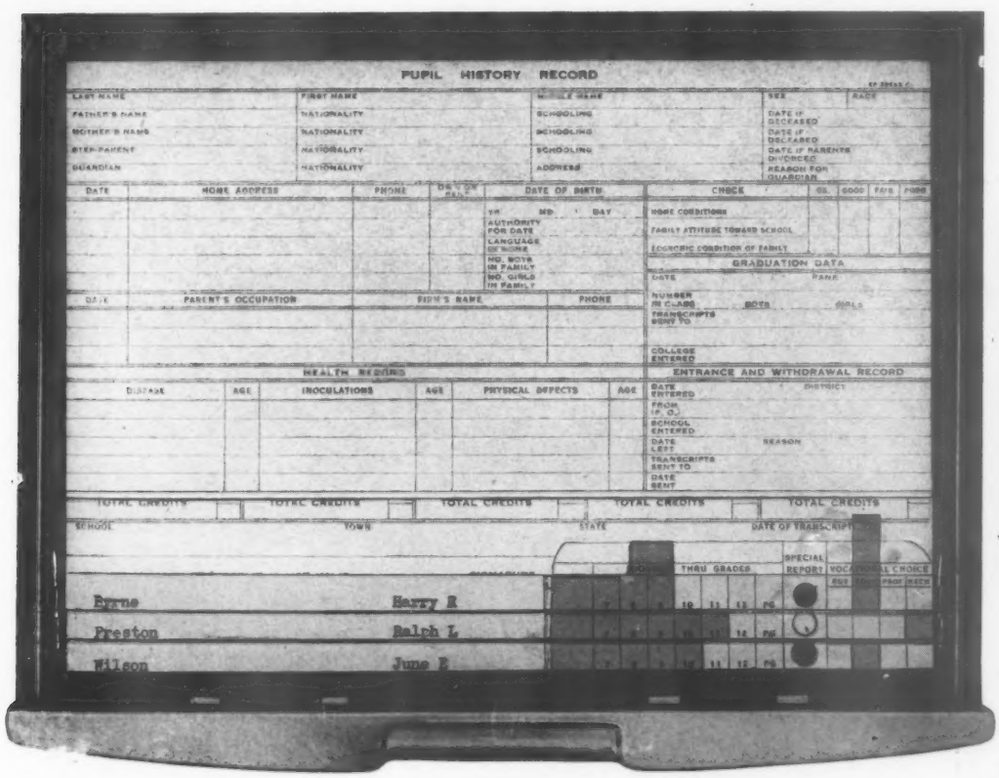
School records in Kardex Visible Systems give school officials instantaneous reference to all pupil, teacher and staff activities—providing an efficient, centralized record control.

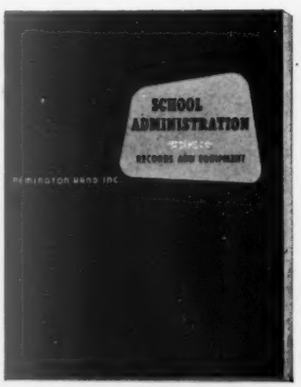
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Left — Pupil record of a Junior-Senior High School. Signals dislose progress through grades and vocational choice

A few of the Records for which Kardex is universally effective . . . Pupil History Record . . . Pupil Guidance Record . . . Pupil Health and Physical Education Record . . . Pupil Attendance Record . . . Pupil Program Record . . . Purchase and Stock Record . . . Teacher Placement Record . . . Teacher Substitute Record . . . Budget and Financial Record . . . Textbook Record

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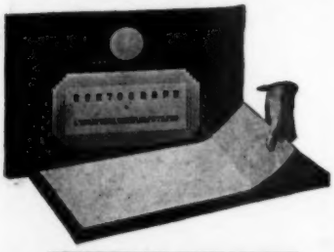
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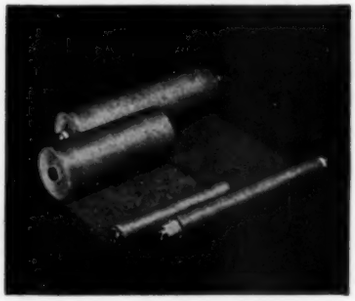
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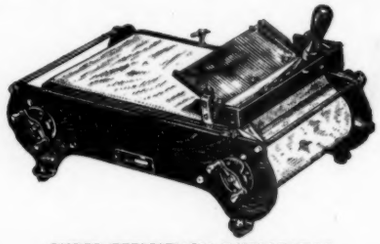
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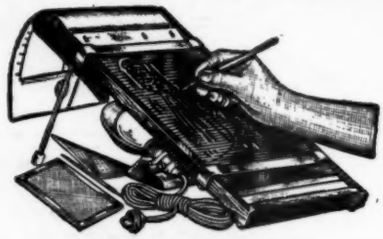
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18 Varieties of Styli points with plastic handles. Guides for many type faces and sizes

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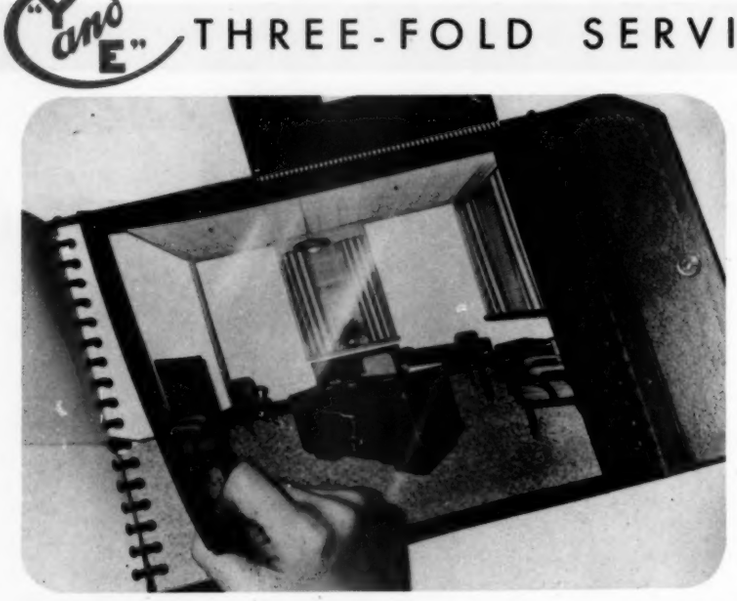
Color, Design and Function

IN PLANNING THE MODERN OFFICE



- **COLOR** *for Harmony and Light Refraction*
- **DESIGN** *for Appearance and Comfort*
- **FUNCTION** *for Efficiency*

"Y and E" THREE-FOLD SERVICE FOR MODERNIZING A



1. COLOR HARMONY *Visualized*

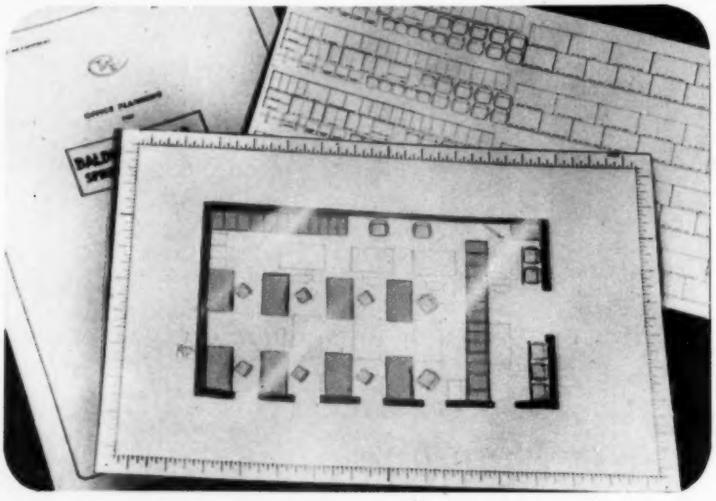
2. DESIGN *Modern but not Moderne . . .*

A Complete Family of Steel Desks for:

THE EXECUTIVE
THE ASSOCIATE
THE GENERAL OFFICE

Files and Counter Equipment





3. FUNCTIONAL *for Efficiency*

PLANNING FLOW OF WORK TO USE FLOOR SPACE TO BEST ADVANTAGE

Making a graphic portrayal by use of portable Scaled Dimensional Equipment Blocks

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

AND FUNCTIONALIZING THE OFFICE IN STEEL

Color

Recognizing that office efficiency bears a definite relationship to the worker's surroundings—whether top executive or junior clerk—"Y and E" engineers several years ago began a series of tests that have revolutionized office planning and layout.

The chief factor in any office is the equipment. The greater part of every worker's time is spent at his desk, hence "Y and E" engineers selected the desk as the keynote of the whole plan of stepped up work efficiency.

In so doing they took recognition of a long neglected factor of the utmost importance to the user of that desk, namely, eye fatigue. Too great contrast . . . too little contrast require extra muscular adjustment by the worker's eyes—cause headaches, tiredness and all the many familiar symptoms of eye fatigue.

To correct this condition "Y and E" engineers, after three years of research, developed Neutra-Tone Gray, an entirely new finish for office equipment. It is a special and exclusive blend of various pigments that reduces light absorption 30%. One of the nation's leading illumination experts has pronounced Neutra-Tone Gray to be a *warm gray* and a scientifically correct finish having a minimum of glare and light absorption.

It was soon recognized that the color harmony of the offices was an important factor in still further increasing working efficiency. The blending qualities of the Neutra-Tone Gray finish immediately made possible a much larger number of decorating combinations than had ever been available with a single color.

By so greatly expanding the possible combinations, you may now plan the exact color scheme that best suits your requirements . . . without the expense of special furniture finishes.

Color Combinations

To help you visualize to the fullest the possibilities of this important new color development, our engineers have prepared an ingenious four-way *color visualizer* that enables you to study a large number of possible color combinations. Colors have been selected for:

1. Standard colors for wall paints.
2. True lithographed reproductions of rugs and carpets.
3. Window drape reproduction in color.

All these color units are so fastened in a ring binder that any combination can be brought together conveniently. To this is added a transparent sheet on which is printed office furniture in Neutra-Tone Gray finish. Thus, you can study all the important factors that enter into selection of an office color scheme, and prove that the new "Y and E" Neutra-Tone Gray will harmonize with all decorative elements. You may obtain the use of this color visualizer merely by calling or visiting the "Y and E" Branch or representative in your city.

Designed for Comfort and Harmony

The complete family of "Y and E" "Style Master" steel desks and tables covers every type of office work space requirement. The "Executive," the "Associate," and the "General Office" lines are designed to function in a modern efficient manner.

The comfort and harmony factors stressed in the design of the "Style Master" (4900 line) steel executive desk are:

Streamlined for appearance and architectural conformity.
Molded non-glare linoleum top to ease eye strain and do away with uncomfortable edges.
All outside corners and edges molded (no sharp corners).
Trim (drawer pulls, etc.)—especially designed to conform with contour of desk.
Wide pedestals (cap size)—to balance proportions.
Base—recessed box type, black enameled.

The "Styled Executive" (4900 line) is the result of much study and consultation with many of the top ranking business executives and architects of the country.

Architects specializing in office modernization recommend "Y and E" "Style Master" steel desks because their modern design and balanced appearance conform with the lines of present day plans for office buildings and their interiors.

The "Styled Associate" (6900 line), illustrated more completely on pages 6 and 7 of this catalog section, has the same general streamlined design, the same smooth rounded corners and edges for comfort and harmony. These steel desks, like the executive line, are designed without legs to give greater knee space and more foot freedom. One principal difference is the base unit—instead of a recessed box base, there is an island base under each pedestal. These desks are adjustable in height to the individual's requirement.

The "Styled Suspension" (7900 line) is a complete alternate intended primarily as a general purpose line. Although this line is designed with four legs, the rounded edges and corners make it very desirable for general use. The absence of center legs allows plenty of foot freedom. The top is of the conventional flat top type with the same grade linoleum as is used on the other two lines. The top is bound with a molded white metal protection strip.

Functionalized for Flow of Work and Efficiency

Making records and having them available constitutes a big part of what is called office routine. "Flow of Work" is the term applied to the efficient handling of this important detail. Those who do the work should be so placed that there is "Line Production," a term just as pertinent to the office as to the factory. Desks and files of various types for specific jobs must be arranged so that workers get the proper advantages of light and air, also so that there will be as little back tracking as possible, thus reducing duplication of effort and simplifying supervision.

When you start to point out changes in office layout to increase efficiency, the graphic picture is necessary. To present these suggestions as vividly as possible, "Y and E," through their sales engineering department, has provided a complete floor planning outfit for presenting a comparison of the old plan and the suggested new one.

This floor planning outfit is simple. It consists of 4 elements or parts, a white sheet with inch scale on all sides to make it easy to draw up a plan of the present floor to one quarter inch scale.

A rough sketch of the suggested new layout is made. The various desks, files, etc., are cut from a sheet of gummed-back cloth showing scaled furniture. On this sheet the pieces are printed to one quarter inch scale. By the aid of a celluloid sheet placed over the old floor plan, the new plan is set up by using the cut out gummed blocks in their new proper work flow arrangement. In this way the advantages of the plans (new and old) are easily compared.

This plan visualizes the exact picture to the management. Should changes be desired, the units may be lifted off and rearranged.

For Brighter, More Liveable, More Productive Offices.

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

. . . OFFICES IN WHICH "Y and E" SERVICES ARE BEING USED—BA



ONE of several views showing a large installation of "Y and E" "Style Master" Associate (6900 line) steel desks—part of the general offices of a large national manufacturer. These desks were selected after a thorough survey of steel desks available. Color and design made these desks their first choice.

The non-glare molded linoleum tops . . . warm gracefully rounded outside edges and corners and easy operating drawers were big factors in determining their selection.

The color harmony used throughout the general offices of this company is: Floor covering—marbleized warm tone brown. Walls—warm gray. Ceiling—flat cream. Blinds—cream.

THE offices of this large Public Utility Company are equipped with "Style Master" Associate (6900 line) steel desks. Here is shown a view of one of their Public Relations Offices. Customers come here to discuss service and arrange for contracts. This company has found color harmony a big asset, especially where the public is constantly contacted. The color scheme is pleasing and restful. Floor—two tone gray marbleized, with dark gray feature stripes. Walls—gray blue. Ceiling—same as walls, but much lighter. Blinds—ivory. The "Y and E" Neutra-Tone Gray Associate (6900 line) desks are most pleasing. Chairs upholstered in terra-cotta leather give sparkle and cheerfulness to the business atmosphere.





SPACE is often a greater problem in a large office than in a small one. When a hundred or more desks are to be placed in a given space, every inch counts. In this general office of a nationally known company, "Y and E" "Style Master" Associate (6900 line) steel desks, with their close compact construction and safety features, were most desirable. In offices of this size, color is genuinely important. Surveys show that color harmony reduces fatigue and stimulates concentration and greater effort. Floors—warm tones of browns marbleized. The walls of this and other offices of this company are a warm gray. Ceiling and blinds are flat cream.

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

ED-BANKS AND HOSPITALS USE "Y and E" SERVICES—ALSO SCHOOLS



THIS large automobile service and travel club took advantage of the cooperative services of their architect and "Y and E" engineers. The result was the creation of this modern office for their customer relations. The "All Clear Beneath" feature of the 7900 line together with Neutra-Tone Gray finish and rounded top and body corners made these desks desirable for use with the public. The floor is covered with a rich deep rust carpet. The walls are a delightful beige with light tan drapes. Ceiling—an off-white cream. The Kodachrome reproduction here shows only one wing of the office.



THE office of a Vice-President of a large national manufacturing company. The selection of furnishings was made after the architect approved the color and design of "Y and E" "Style Master" Executive (4900 suite).

This office is a large one often used for group meetings and for consultations with customers. Note the "Style Master" Executive (4986) steel desk and the (4939) steel directors table and the (4987) steel book case. Floor covered with two-tone gray twistweave carpet. Walls are walnut flexwood, matched grain, natural finish. Ceiling—flat white. Blinds—light gray. The chair upholstering is an unusually pleasing light blue fabric.

ONE of the general offices of a large national manufacturer; another good example of the practical application of space saving design and flexibility of construction. Those in this office find it more convenient to have the letter drawer of the steel desk at the top of the pedestal. All "Style Master" steel desks have this interchangeable drawer feature. Many of these desks are equipped with transcribing machines in these top drawers. The desks are Neutra-Tone Gray. Floor—gray brown marbleized. Walls—are cream. Ceiling and blinds—light gray tint. Chairs—dark green mohair upholstering.

These six pictures illustrate how the "Y and E" Neutra-Tone Gray finish harmonizes with different color combinations produced by floor covering, wall treatment, drapes, etc.

Why not let us give you the benefit of our experience in planning brighter and more liveable offices.



BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

MODERN STEEL DESKS BY "Y and E" FOR COMFORT AND SERVICE

STYLED EXECUTIVE LINE

THE "Style Master" Executive steel desk and companion pieces (4900 suite) illustrated on the opposite page, are truly Executive quality from the standpoint of color, design and function (harmony, dignity and useability).

The smooth harmonizing linoleum molded top is protected with rounded corner caps and a binding of white metal. This produces a streamlined effect that reduces the appearance of size. Wide Pedestals, which offer better balanced appearance, give added drawer capacity. The extra small drawer at the top of each pedestal is very useful for papers ready for dictation, reports, charts and other important active items. The Card Drawers and large cap size drawers operate on easy running combination ball and pin-bearing cradle type progressive suspensions. These cap drawers are 15½" wide inside and provide 26" of filing space for legal documents or 30" of filing space for letter size papers. The latter is accomplished by the use of an insert which makes the cross filing of two rows of letter size material possible. These desks are equipped with a receding box type base.



4986.1—66x34
Cap width Pedestals

STYLED ASSOCIATE LINE

THE "Style Master" Associate steel desk (6900 line) rounds out the Executive Line for use by Junior Executives and general office use. These desks are modern in design and there is a model available for all requirements.

There are various types of Secretarial and Typists' Models, including the fixed bed and Stow-Away type. All Letter and Cap size Drawers operate on easy running combination ball and pin-bearing cradle type progressive suspensions, and drawer positions in pedestals are interchangeable. The base unit is the island or skid type equipped with four adjustable gliders.

The models illustrated on the opposite page do not cover the entire Associate (6900 line). To better appreciate all the unusual features of this line and to check dimensions to meet specific requirements, send for the "Y and E" complete steel desk catalog.

These desks are adjustable in height to the individual's requirement.



6986.1—66x34
Cap width Pedestals

STYLED GENERAL OFFICE LINE

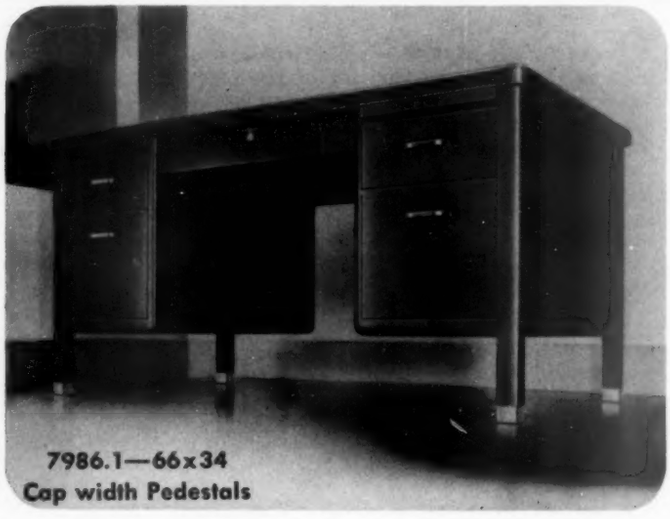
THE "Style Master" Suspension steel desk (7900 line) is a complete alternate general purpose line. This line is extensive, as illustrated on the opposite page.

These desks have four legs with all outside edges rounded to give greater comfort and reduces accident hazards. The conventional type Flat Top with rounded corners is used. The top is covered with the same high-grade linoleum and securely bound with a molded white metal strip for protection.

The utility features, as offered in the Styled Associate Line, are the same in this line.

Cross filing inserts are available for all letter and cap size drawers, an important time savings factor. Contents can be indexed with guide tabs facing the user.

All "Style Master" Steel Desks provide for concealed wiring so that your desk top is always free from exposed telephone buzzer and desk lamp wires.



7986.1—66x34
Cap width Pedestals

BRANCHES IN THE LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS AND DEALERS EVERYWHERE

THERE IS A MODERN DESIGNED "Y and E" STEEL DESK FOR EVERY NEED



4987
Executive Bookcase



49604
Executive File



49204
Executive File "Desk-Hi"



4919
Costumer



4939
Directors' Table



4966
Companion Table



Y1900
Arm Swivel Chair



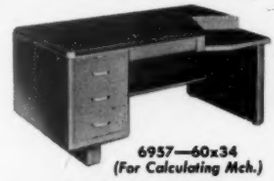
6900—*6903—60x34
*6954.3—55x34
(*3 Card Drs. L. Ped.)



SP6950.3—50x341 Cap Dr.
6921—45x341 Lot. Dr.



6900RT and LT—60x34
*6904LT and RT—60x34 Card Drs.
*6954.3LT and RT—55x34 Card Drs.
(*3 Card Drs.)



6957—60x34
(For Calculating Mch.)



6942.3FB—42x34



6903FB—60x34
6954.3FB—55x34



6966—66x34
6934—60x34



6954.3D—55x34



6937—72x34



6942.3D—42x34

6954.3LT or RT—55x34

The Stow-Away type of secretarial steel desk with provision for typewriter in either left or right pedestal.

To stow away typewriter—lower front of hinged typewriter platform. When folded down, it will easily ride into pedestal. Advantage — saves office space.

6940—18x18





*7900—60x34
7903—60x34
7953.3—50x34
7951.3—50x30
(*1 Cd. and 1 Let. Dr. in ea. Ped.)



7921—45x34
*7923—45x34
(*3 Card Drs. in R. Ped.)



7960.4—50x30
*7960.5—50x30
(*2 Card Drs. in ea. Ped.)



*7900LT—60x34
*7900RT—60x34
7904LT and RT—3 Cd. Drs.
(*1 Card and 1 Let. Dr.)



7903D—60x34
7953.3D—50x34



7923D—45x34



7903FB—60x34
7951.3FB—50x30



7923FB—45x34



7955—45x30



7925—36x24



7937—72x34
(Two Drawers)

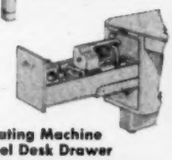


7966—66x34
7934—60x34
7949—50x30
7944—45x34
7938—36x24



7940—20x17

All Letter and Cap drawers of "Style Master" Steel desks can be equipped to house any of the dictating machines. Electric contact is broken when drawer is closed. Illustrated at right.



Dictating Machine
in Steel Desk Drawer

BRANCHES
IN THE
LARGER CITIES

YAWMAN AND ERBE MFG. CO.

AGENTS
AND DEALERS
EVERYWHERE

"Y and E"

EMPIRE FILES ONE, TWO, THREE, FOUR AND FIVE DRAWERS

STREAMLINED COUNTERS

The Modern Counter is made of FILES



Counter files is the name given to all three drawer (cap and letter) height files. They are 41 3/16" high and when any combination of these files is placed together, they form a practical counter at a height that provides comfortable working or consulting space. Separate tops and backs finish these counter files to meet any requirement and allow unobstructed view of the office. The counter illustrated is the latest streamlined molded top type, same as used on Executive and Associate desks. This counter creates an attractive inviting atmosphere for the public who transact business over it.





The before and after illustrations at the right show the solution to what appeared to be an expansion problem. A bank was about to enlarge its quarters because there was no longer sufficient space for their customers. Here again cooperative service between the architect and "Y and E" brought about a very satisfactory result, in the same space.

SPACE SAVING—*Before and After*

The illustration below is an example of how five-drawer files are used to advantage—note the counter files forming an aisle through the center. Where space is a factor and four-drawer files are in use, congestion can be relieved by placing one-drawer files on top.



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Write for Catalog of Steel Desks and Files

SINGER SEWING MACHINE COMPANY

149 Broadway, New York 6, N. Y.

Why teachers prefer SINGER Sewing Machines:

1. "Stand up under hard wear." Singer machines have a 95-year reputation for "taking it"—even the hard abuse of sewing-class pupils!
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THE SINGER STUDENT MODEL . . . No. 201-2-401 great favorite for school duty because it combines the latest and best sewing machine head with a specially designed sturdy cabinet that is ideal for classroom use.

- **Larger bobbin capacity**
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- **Improved back-tacking device**
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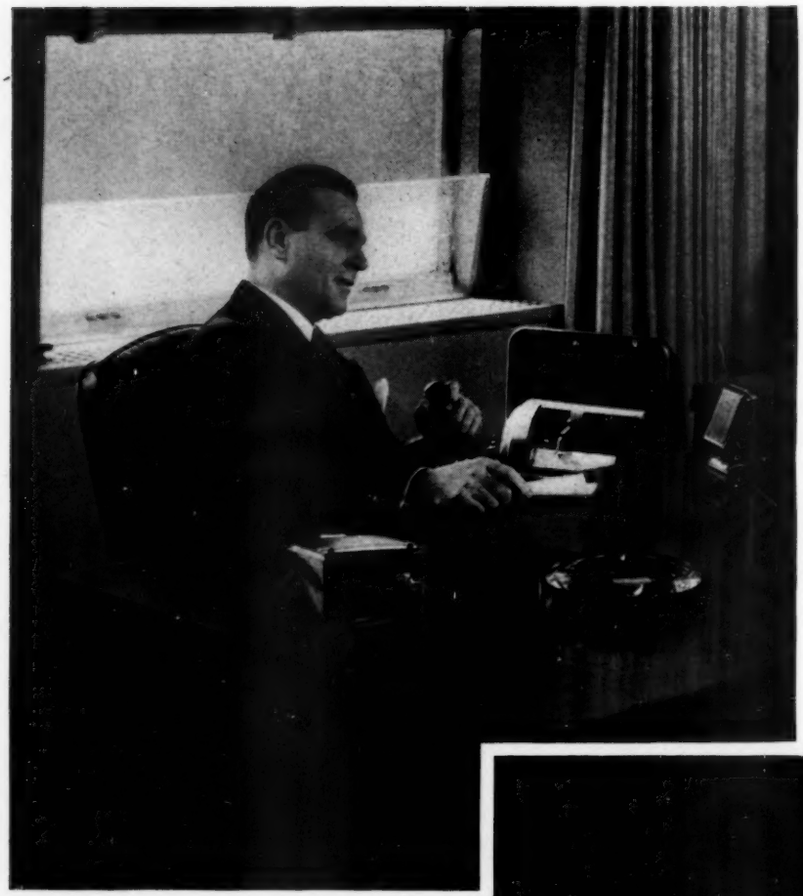
ORDER YOURS NOW! If you wish, an expert will work out for you a "Replacement Program" based on successful replacement schedules used by other schools.

CONTACT YOUR NEAREST Singer Sewing Center for free help in planning classroom requirements. Or write Educational Department, Singer Sewing Machine Co., Dept. 735, 149 Broadway, New York, N. Y.

DICTAPHONE CORPORATION

420 Lexington Avenue EDUCATIONAL DIVISION New York 17, N. Y.

How to equip your students



The microphone on the desk of this executive has become the dictation Control Center through which he and his secretary maintain constant and precise control over a great corporation. It is the "microphone heart" of Dictaphone Electronic Dictation.



Secretary to the executive above, she is handling an important telephone conversation for her employer. Because of her ability as a Dictaphone secretary she was chosen for this interesting and responsible position.

★ **Important positions as secretaries to executives are *always* available to high-school and college graduates who have completed the Dictaphone Business Practice Course and earned their Certificate of Proficiency.**

The *present-day* demand for trained Dictaphone personnel is unprecedented. Executives, faced with the accelerated pace of post-war business conditions, have rapidly adopted the Dictaphone Electronic Method because it enables their secretaries to expedite the transcription of dictation, thus freeing their time for the performance of other more important tasks.

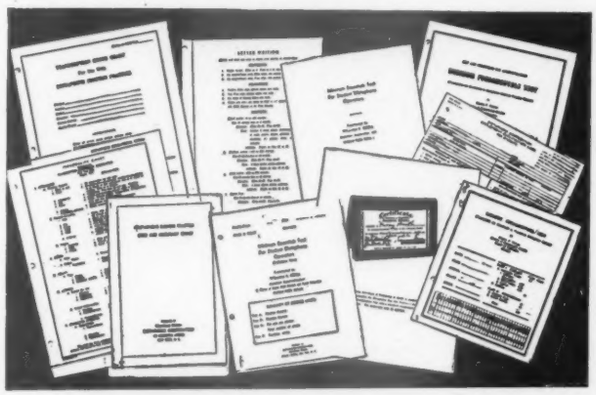
The Dictaphone Method is popular with the secretary because it enables her to screen the executive from countless interruptions, handle appointments . . . to become, in fact, his executive assistant.

DICTAPHONE CORPORATION

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for top-paying positions

The best secretarial job-insurance you can give your students is the one-semester Dictaphone Business Practice Course. Make certain that *your* graduates are fitted for these important positions. Write today for complete information.



● Every student prizes the Dictaphone Certificate of Proficiency which is awarded upon the successful completion of the Dictaphone Business Practice Course.

● The Dictaphone Portfolio of Teaching Aids explains the Dictaphone Business Practice Course and contains samples of the many teaching guides and student worksheets that are a part of this one-semester course.

● This executive, who depends upon Dictaphone Electronic Dictation to make his work easier, recognizes the Dictaphone Certificate of Proficiency as a badge of secretarial efficiency.



The word DICTAPHONE is the registered trade-mark of Dictaphone Corporation, makers of Electronic and Acoustic dictating machines and other sound recording and reproducing equipment bearing said trade-mark.

THE EDIPHONE—THOMAS A. EDISON, INC.

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Creator of Opportunity

A multitude of new demands has been imposed upon executive time and energy by present day business conditions and regulations.

There is an unprecedented interest in faster methods of dispatching the day's work. Demand for Edison Electronic VOICEWRITER equipment has never been so great as it is today.

Better, more remunerative positions and a broader field for advancement await the graduate who can step into this modern business picture as a trained Ediphone secretary.

The Edison Electronic VOICEWRITER gives her a new opportunity to increase her value to business and to herself.

Provide Your Graduates With This Valuable Training

The Ediphone Course provides complete school material, authoritatively prepared and completely integrated with English, typing, punctuation, syllabication and other secretarial topics.

Free Teaching Material

Included, at no cost, in the course, "Ediphone Voice Writing and Integrated Studies," is such necessary school material as:

Student's Text-Book . . . Teacher's Manual . . . Qualifying Tests . . . Full-length Practice Records . . . Letterhead Pads . . . Transcription Error Charts . . . Personality Rating Chart . . . Certificate of Proficiency.

AUTHORITATIVE—It is published by specialists in business education—South-Western Publishing Co. Not the work of an individual, but written by educational authorities (Kilduff, Goodfellow, Allen, Card and Copeland) this course is at once practical, functional, thorough.

THREE PHASES—Divided into three natural phases of instructions, "Ediphone Voice Writing and Integrated Studies" follows the step-by-step method of logic.

SPECIFIC—Each lesson has a specific objective—each has suitable typewriter drills. The course is completely indexed—well illustrated. The "why" of each direction is given. So clear that it is the *only* text that can be left with the student.

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TEACHER'S MANUAL—Provides a comprehensive Ediphone Voice Writing background. Tells the "what," "how" and "why" of classroom instruction.

Investigate the *complete* Ediphone secretarial course, "Ediphone Voice Writing and Integrated Studies." For full information simply write Dept. U46, Thomas A. Edison, Inc., West Orange, New Jersey, or Thomas A. Edison of Canada, Ltd., 29-31 Adelaide St. West, Toronto 1, Ont.

FOR SCHOOL ADMINISTRATIVE USE—As easy to use as the telephone, the Edison Electronic VOICEWRITER will cut your letter-dictating time from 20% to 50%. Memos, notes, dates, instructions, ideas are recorded as you think of them—your mind freed for real administrative problems.

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Typewriters, Accounting Machines and Adding Machines

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YOUR AIDS IN SCHOOL ADMINISTRATION



The *New* Standard Underwood Typewriter—the *Machine of Champions* made by the typewriter leader of the world

By utilizing these world-famous Underwood products, the busy school executive will gain s-p-e-e-d, efficiency and service. The business world affords ample proof of their sterling performances. Today many schools and universities realize that they must consider the purchase of new equipment to replace prewar machines. This is the time to consult your Underwood Representative.

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Do you love a winner? For 25 years world champion typists won consecutive victories on the keys of the swift, responsive, "Machine of Champions". The neophyte stenographer as well as the expert secretary can depend upon this machine just as the typing champions have done. Six million typewriters are back of the Underwood you buy today. *Rhythm Touch,* heads a long, imposing list of up-to-the-minute operating features.

For your *personal* writing needs . . . you can choose an Underwood Champion, Universal or Noiseless 77 Portable . . . a model for every need at a price to suit any purse.

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Standing at the head of the modern supply line . . . is Underwood. A pioneer in the office supply field, Underwood Corporation continues to lead in superior quality, efficiency and service. Keeping in step with Underwood's rigidly high machine standards, Underwood Corporation supplies also help to s-p-e-e-d the world's business. Our carbon rolls, carbon tally rolls, adding machine rolls, type cleaners, typewriter pads, typewriter ribbons, carbon papers and other supplementary supplies are considered *musts* in many efficiently operated offices.

Something New! The Underwood Carbon Paper Package—the modern, colorful, streamlined box . . . combines beauty with high utility. Hundreds of stenographers and secretaries told us what they wanted . . . this new package is the answer . . . the first new Carbon Paper Package idea in 50 years!



First *New* carbon paper package idea in 50 years

Other new improvements include NON-CURL carbon papers that stay flat . . . a new High Contrast ink for clearer carbon copies . . . distinctive identification on every sheet—reminding you to specify, "The Underwood Key to Best Results."

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10-KEY KEYBOARD MEANS S-P-E-E-D

Adding, subtracting and figuring operations are made easier for both the novice and expert operator. The Underwood Sundstrand Adding-Figuring Machine makes this possible . . . with greater speed . . . with less fatigue.

Equipped with its famous 10-Key Keyboard, this modern business machine s-p-e-e-d-s the world's figures. The basically arranged 10-Key Keyboard is operated by the fingers of ONE hand. A few minutes of practice . . . and the touch operation becomes the easy, natural way to work. Even a beginner learns in a surprisingly short time.

Ideally suited for instruction purposes, the Underwood Sundstrand is available in both manually and electrically operated models. Each machine is backed by nation-wide service facilities.



Famous Underwood Sundstrand 10-Key Keyboard Adding Machine controlled by the fingers of *one hand*—speed with less fatigue

WHY AN ACCOUNTING MACHINE?

Universal use of accounting machines has clearly demonstrated outstanding reasons for substituting this modern method for obsolete, unreliable pen and ink methods.

Important reasons why administrators favor mechanical accounting include:

1. PROOF OF ACCURACY — Accounting machine methods prove the accuracy of work *as work is being done.*
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3. VALUABLE INFORMATION —Always available with machine-kept records; every account always balanced.
4. SAVES VALUABLE TIME — Faster posting, . . . eliminates errors . . . conserves time . . . prompt monthly closings.



The Sundstrand Accounting Machine. Outstanding feature: 10-Key Keyboard . . . permits high-speed Touch Operation with fingers of one hand

Underwood offers *both* the method and equipment to meet your exact requirements. Three *distinctive* lines of accounting machines: Underwood, Elliott-Fisher or Sundstrand insures the right machine for administrative or classroom use.

For instance — the Sundstrand Accounting Machine—designed for the many accounting records not requiring use of a typewriter keyboard. Modestly priced, it is used widely for many accounting jobs involving simple computing requirements.

Outstanding Sundstrand feature —10-Key Keyboard . . . permits high-speed TOUCH OPERATION with fingers of one hand. Your Underwood representative, skilled in machine methods, is trained to help you select the proper accounting machine.



The school executive knows that Underwood products help to speed progress in commercial classes . . . that they accelerate administrative operations and add to his staff efficiency. Further information on these dependable products with nation-wide acceptance, may be obtained from your Underwood Representative or by writing us direct.

50 Years of Leadership!

BAVINCO MANUFACTURING CORPORATION

Designers and Manufacturers of
BAVINCO Home Economics Equipment
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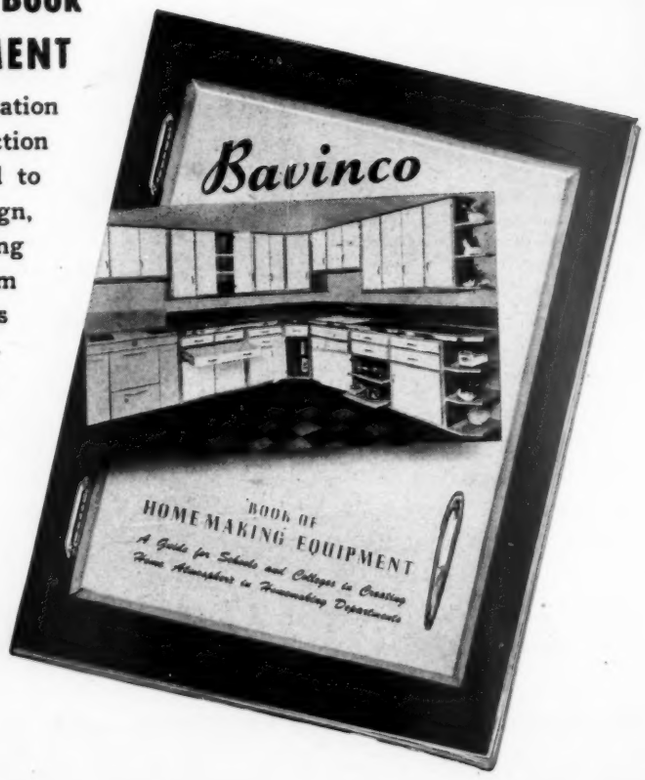


THIS IS THE KITCHEN
I WANT IN MY
HOMEMAKING DEPARTMENT

EQUIPMENT DESIGNED SOLELY FOR HOMEMAKING DEPARTMENTS

Announcing Bavinco's New Book of HOMEMAKING EQUIPMENT

The Bavinco Manufacturing Corporation proudly presents this most modern collection of homemaking helps, especially compiled to assist all persons interested in the design, construction and operation of Homemaking Departments. Illustrations of typical room types, suggested room layouts and Bavinco's complete line of famous homemaking equipment will serve as a handy guide and ready reference in the design and modernization of all Homemaking Departments, large and small.



Bavinco's finely fabricated, home-like equipment has been specially designed to meet the ever-changing needs of Homemaking Departments. Authentic, up-to-date home atmosphere is built into every Bavinco installation to bring approved home surroundings to the classroom for greatest teaching efficiency.

Write for your copy of this new book.

The Finest Electrical Equipment for the HOMEMAKING DEPARTMENT

G-E Consumers Institute Laboratory Kitchen



GENERAL ELECTRIC COMPANY

APPLIANCE & MERCHANDISE DEPARTMENT

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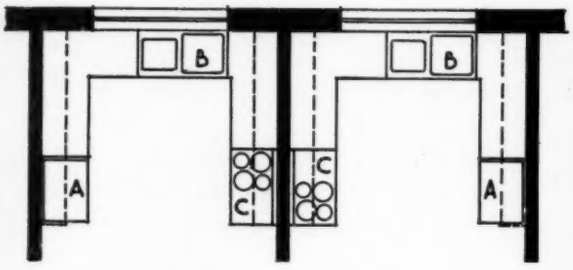
EFFECTIVE PLANNING OF THE CL

Today's home economics classroom must be modern—if it is to train the successful homemakers of tomorrow.

It should be planned carefully on the best principles of modern kitchen and laundry organization. But it cannot be static. Both arrangement and equipment should be changed as often as necessary to keep pace with progressive teaching.

It should be all-electric—with the working efficiency possible only from the finest automatic electrical equipment.

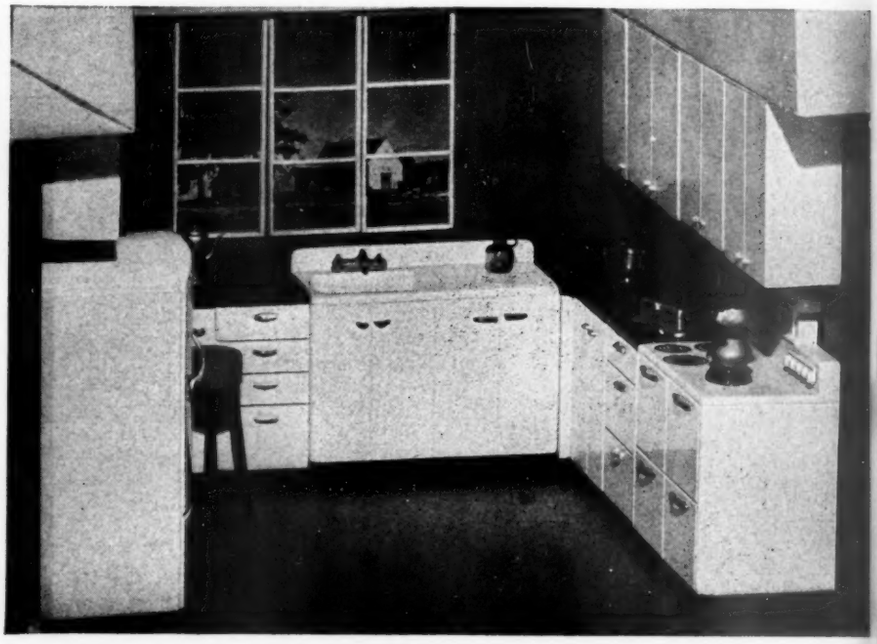
Special laboratory-type facilities—as shown on the page before this one—are good wherever extensive technical research is to be done. But for practical training in general home economics classes, home-type equipment proves the most practical.

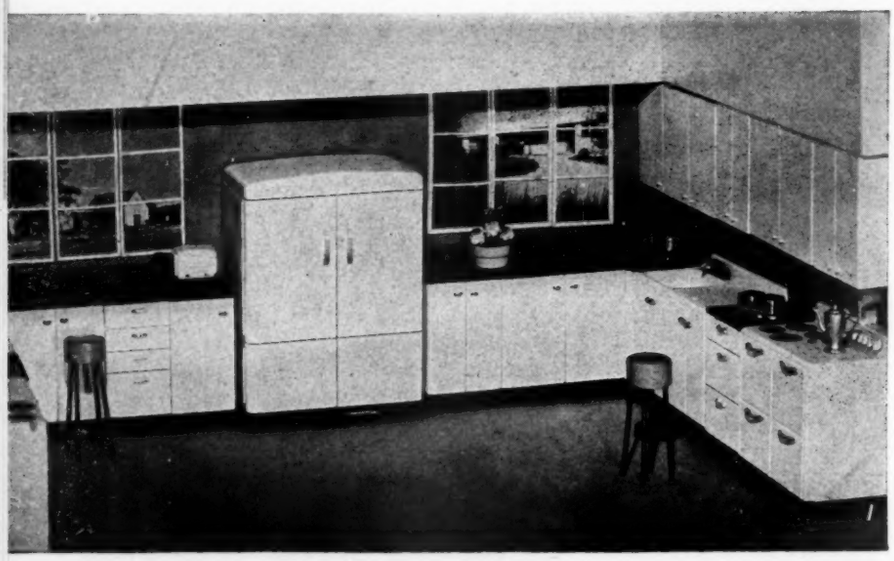


DOUBLE KITCHEN

A REFRIGERATOR B SINK C RANGE

U-shaped kitchens in multiple units provide individual working sectors and homelike atmosphere in a minimum space.







DOUBLE KITCHEN

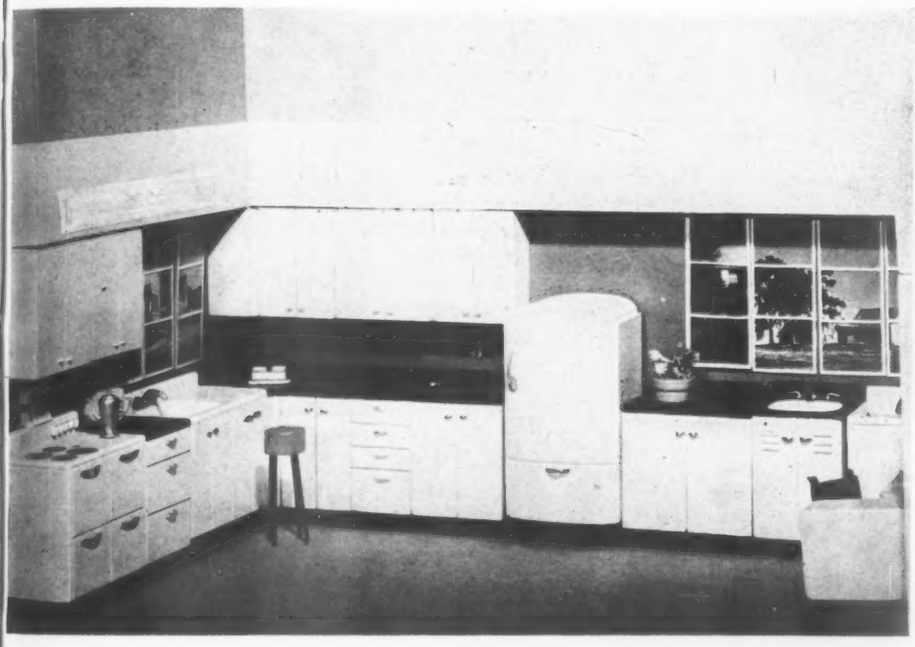
Facing L-shaped kitchens conserve space while maintaining in effect the entity of a complete home kitchen.

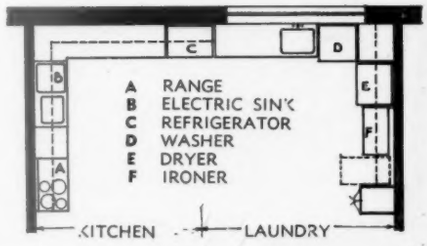
CLASSROOM KITCHEN AND LAUNDRY

The plans and illustrations on these pages are adaptions of good home arrangements to the practical needs of classroom work. They offer actual home conditions re-adapted for effective teaching—for the varied and expanding activities of home economics training courses.

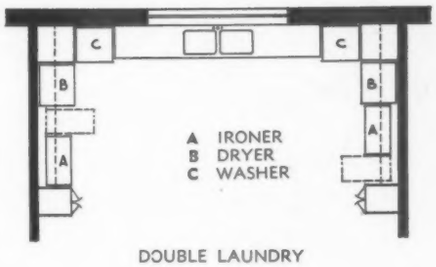
These plans are, of course, only a few of many possibilities for classroom arrangements based on well-designed home kitchens and laundries. Others may be more suitable to your needs.

General Electric, through its dealers and distributors, maintains a service to assist in planning home economics classrooms. At the end of this section you will find the name of the General Electric Distributor in your territory. He will be glad to be of help to you.





Where space is at a premium a combination kitchen-laundry provides all of the facilities, with ample working area for each activity.



DOUBLE LAUNDRY

Compact arrangement of equipment provides two complete laundries in a small working area and with plenty of working space.

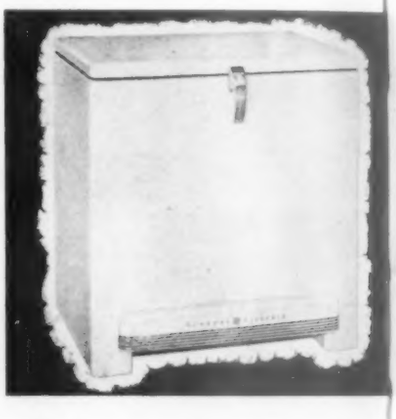


FINE APPLIANCES FOR FINE HO



THE G-E REFRIGERATOR

has the dependable "sealed in steel" refrigerating unit pioneered by General Electric. Available in a variety of sizes and models to meet the needs of all classrooms. It has many special features tested for practical utility and economy in the G-E Consumers Institute Laboratory Kitchen.



THE G-E HOME FREEZER

with the "Tireless Heart"—the same "sealed in steel" refrigerating unit which has made the G-E refrigerator famous for reliability. Zero storage for as much as 140 pounds of frozen food in the 4-cubic-foot model. Automatic interior light, and removable wire baskets for easy accessibility.

THE G-E ELECTRIC RANGE

features "Speed Cooking"—a new kind of electrical cooking—thanks to the G-E Calrod Unit. Safe, clean, and dependable for classroom or demonstration cooking. Tel-A-Cook lights tell what units are on and at what heat. Automatic Oven Timer and famous Tripl-Oven—Master Oven, Super-Broiler, and Speed Oven.

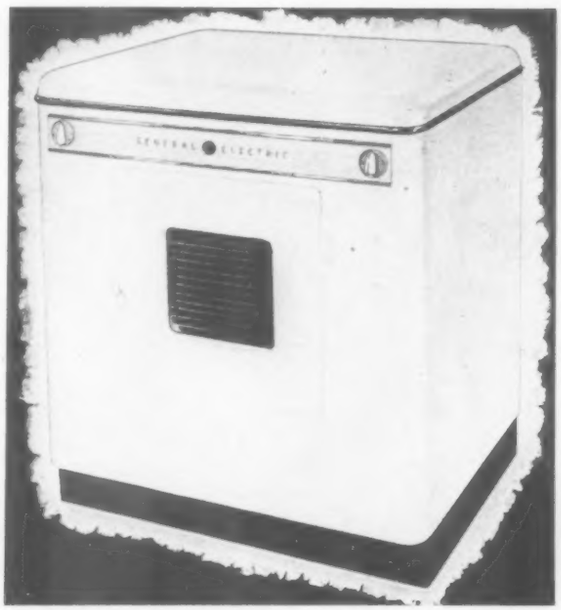


STUDIO MODEL

Twin units of the Studio model range will provide increased surface and oven space in classrooms where space is at a premium.



NE HOMEMAKING CLASSROOMS



THE G-E TUMBLER DRYER

with the automatic "tumbler" action is especially valuable for classroom work. It dries clothes *fast*—eliminating the need of clotheslines and the hanging of clothes. Dries clothes soft and fluffy—or just damp-dry for immediate ironing.



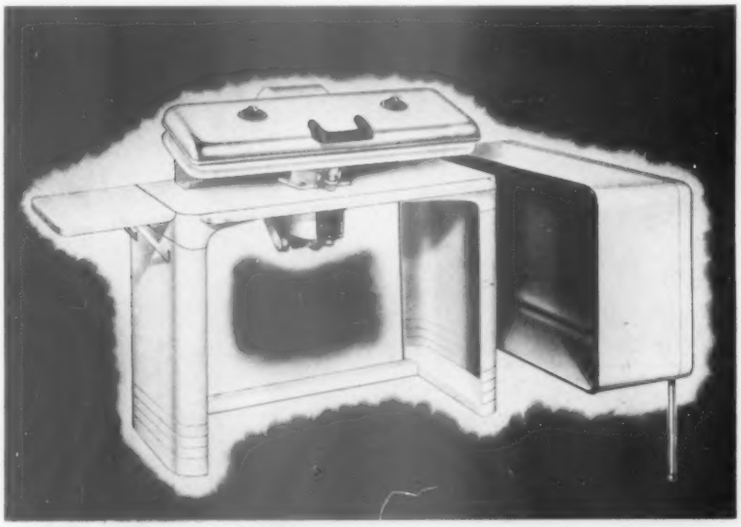
THE G-E WASHER

for quicker-cleaner washing. Thorough, gentle "Activator" action coaxes out dirt. One-Control Wringer simplifies classroom work. Permadrive mechanism means a long, economical life.

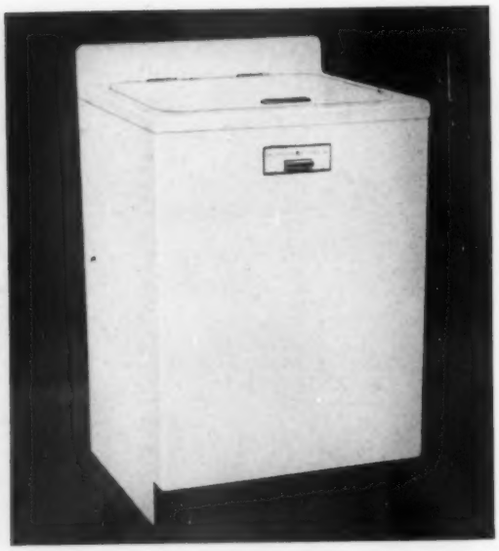
The remarkable new G-E Automatic washer will be available soon.

THE G-E FLATPLATE IRONER

is a sit-down-and-iron marvel that makes ironing easy. It will turn out two flat pieces at a time—and handle shirts and frilly things too. No moving roll—no motion of the appliance with which the operator must keep pace. Automatic temperature control for each kind of fabric — 300-square-inch ironing surface — 400 pounds of pressure—all combine for swift, easy ironing.

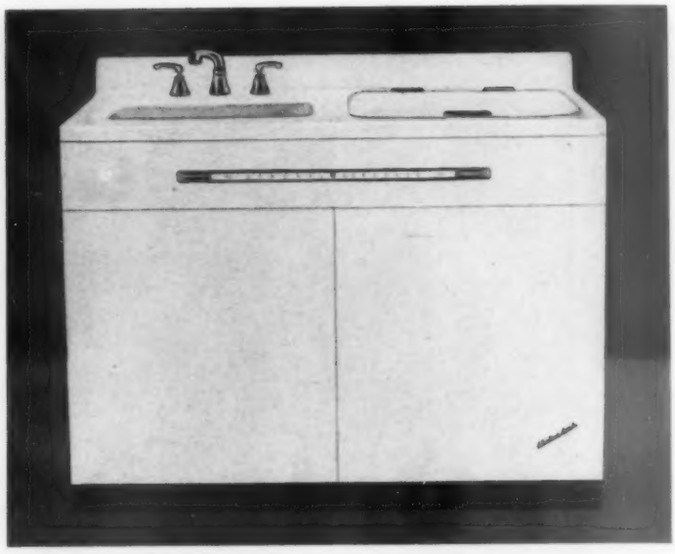


ELECTRICAL EFFICIENCY FOR MODERN H



THE G-E AUTOMATIC DISHWASHER

is the new appliance combining the G-E Automatic Dishwasher and the remarkable G-E Disposall into a single unit. It will wash, rinse, and dry all dishes and pots automatically in a few minutes. It will shred and wash away all food wastes, including bones, before they become garbage.



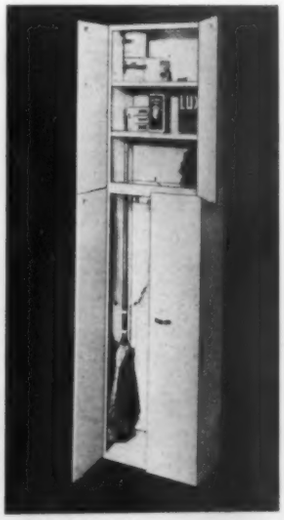
THE G-E ELECTRIC SINK

washes all dishes, pots, pans, silver, and glassware at the touch of a single control—and they dry in their own heat. It is more than a convenience. It is the safe, hygienic, modern method of dishwashing. Greatly reduces dish breakage.



THE G-E DISPOSALL

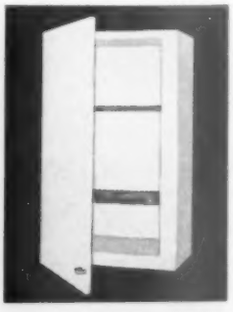
installed in the sink drain will grate all food waste—bones, fruit rinds, peelings—and wash it away down the drain. No odors—The Disposall cleans itself.



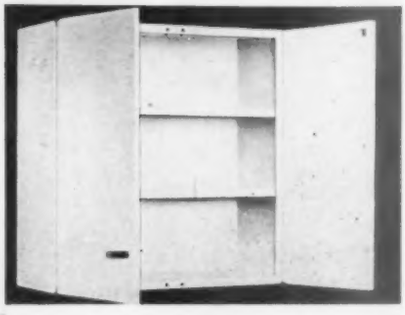
G-E STORAGE CABINETS

are precision-manufactured of steel. Base cabinets are linoleum-topped and have recessed toe space. Wall cabinets have automatic interior lights, and lights for illumination of work surfaces.









HOMEMAKING CLASSES



THE G-E PORTABLE MIXER

takes over countless tasks and speeds all kitchen work. Exclusive three-beater construction assures thorough and uniform mixing. Easily attached juice extractor. Accessories for chopping, slicing, shredding, grinding, and grating, as well as for buffing and drink-mixing.





THE G-E AUTOMATIC ROASTER

is almost a portable electric range. Will roast, bake, pan broil, fry, boil, and steam all foods. Automatic temperature control from 150 to 500 degrees. Will hold a 20-pound turkey or 18 quarts of liquid.

THE G-E AUTOMATIC COFFEE MAKER

is the *only* completely automatic glass coffee maker. You put the ingredients in and push a button. It makes the coffee, shuts itself off—but keeps the coffee piping hot until you are ready for it.



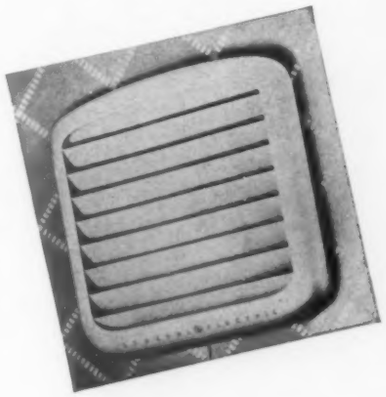
THE G-E STEAM IRON

has all the features of the best automatic dry irons—plus steam ironing for all fabrics.



G-E KITCHEN CLOCKS

are electrically accurate. Self-starting. Beautifully styled in colors to match any decorative scheme.



G-E VENTILATING FANS

for airy, pleasant kitchens. Automatic—in window or wall-grill models.

THE FINEST ELECTRICAL EQUIPMENT FOR THE HOMEMAKING DEPARTMENT

Keep in contact with your local G-E Distributor for information and advice in planning and revising your home economics classrooms. He will be glad to keep you advised of the availability of appliances and their exact specifications. For your convenience, here is a list of the major G-E appliance distributors:

City and State	*Distributor*
Albany, N. Y.	A. Wayne Merriam, Inc.
Albuquerque, New Mexico	Electric Supply Company
Allentown, Pa.	G-E Supply Corp.
Atlanta, Ga.	W. D. Alexander Co.
Baltimore, Md.	G-E Supply Corp.
Birmingham, Ala.	Matthews Elec. Supply Co.
Bloomfield, N. J.	Newark Appl. Dist. Branch
Boston, Mass.	Boston Appl. Dist. Branch
Boston, Mass.	G-E Supply Corp.
Buffalo, N. Y.	G-E Supply Corp.
Butte, Mont.	G-E Supply Corp.
Charleston, W. Va.	Virginian Electric, Inc.
Chicago, Ill.	R. Cooper, Jr. Inc.
Cincinnati, Ohio	Cincinnati Appl. Dist. Branch
Cleveland, Ohio	G-E Supply Corp.
Columbia, S. C.	Perry-Mann Elec. Co.
Columbus, Ohio	Bard, Inc.
Dallas, Texas	G-E Supply Corp.
Denver, Colo.	B. K. Sweeney, Inc.
Detroit, Mich.	G-E Supply Corp.
Dubuque, Iowa	Crescent Elec. Supply Co.
Fargo, N. Dak	Dakota Elec. Supply Co.
Fresno, Calif	Valley Elec'l Sup. Co.
Hartford, Conn.	Orkil Electric Co.
Honolulu, T. H.	W. A. Ramsay, Ltd.
Houston, Texas	G-E Supply Corp.
Indiana, Pa.	Whiteman & Co., Inc.
Indianapolis, Ind	Electric Appliances, Inc.
Jacksonville, Fla	Fla. Appl. Dist. Branch
Kansas City, Mo	G-E Supply Corp.
Lancaster, Pa.	Raub Supply Co.

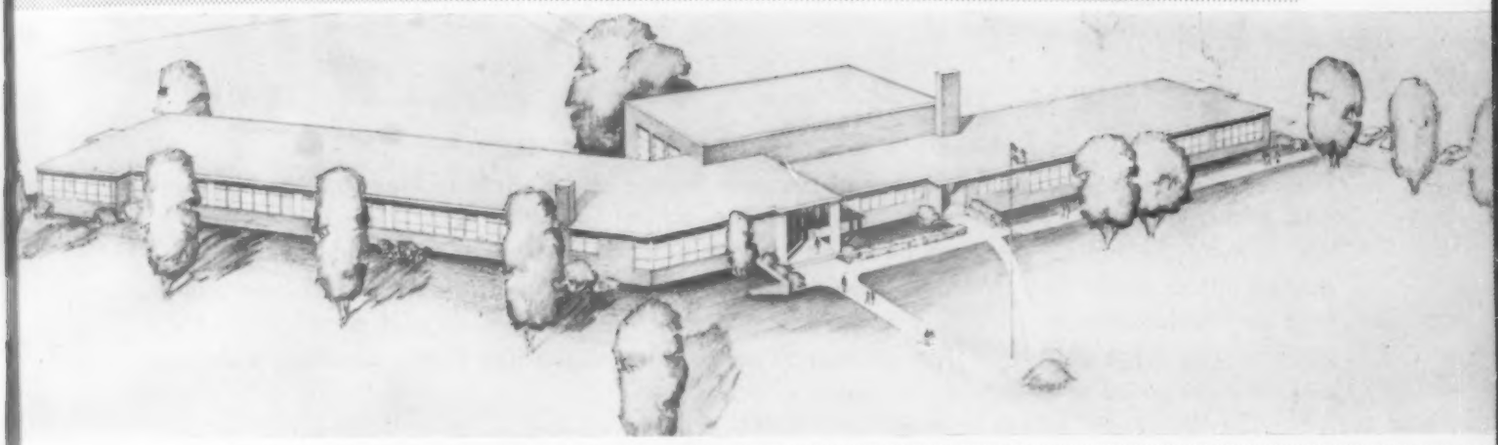
City and State	*Distributor*
Little Rock, Ark	O'Bannon Bros.
Los Angeles, Calif	Los Angeles Appl. Dist. Branch
Louisville, Ky.	G-E Supply Corp.
Mankato, Minn.	Southern Minnesota Supply Co.
Milwaukee, Wisc.	E. H. Schaefer Corp.
Nashville, Tenn.	G-E Supply Corp.
New Orleans, La.	G-E Supply Corp.
New York, N. Y.	New York Appl. Dist. Branch
Oklahoma City, Okla.	G-E Supply Corp.
Omaha, Nebr.	G-E Supply Corp.
Philadelphia, Pa.	Philadelphia Appl. Dist. Branch
Phoenix, Ariz.	Arizona Wholesale Supply Co.
Pittsburgh, Pa.	Pittsburgh Appl. Dist. Branch
Portland, Ore.	G-E Supply Corp.
Poughkeepsie, N. Y.	Electra Supply Co. Inc.
Providence, R. I.	E. Pulver Cook, Inc.
Raleigh, N. C.	Nash-Steele Electric Co.
Richmond, Va.	R. S. Montgomery, Inc.
St. Louis, Mo.	St. Louis Appl. Dist. Branch
St. Paul, Minn.	G-E Supply Corp.
Salt Lake City, Utah	G-E Supply Corp.
San Francisco, Calif.	G-E Supply Corp.
Seattle, Wash	G-E Supply Corp.
South Bend, Ind.	South Bend Electric Co. Inc.
Syracuse, N. Y.	Gould-Farmer Co.
Tampa, Fla.	Florida Appl. Dist. Branch
Terre Haute, Ind	Advance Elec. Co.
Toledo, Ohio	Commercial Electric Co.
Utica, N. Y.	Langdon & Hughes Elec. Co.
Washington, D. C.	G-E Supply Corp.
Williamsport, Pa.	Lowry Electric Co. Inc.
Worcester, Mass.	Coghlin Elec. Co.

APPLIANCE & MERCHANDISE DEPARTMENT

GENERAL ELECTRIC COMPANY

BRIDGEPORT CONN.

BLODGETT BAKING & ROASTING OVENS



. . . AND THE SCHOOL FEEDING PROGRAM

●

WHETHER your school feeding program is based upon hot meals, or upon sandwiches and desserts. Blodgett Baking and Roasting Ovens are essential units for your purposes.

Where basic menus call for piping hot meals, Blodgett Roasting, Baking or Combination Roasting and Baking Ovens prove valuable aids to fast, easy production of palatable, nutritious foods.

Where nutritional programs are based upon sandwiches, Blodgett Baking Ovens are producing the essential, premises-controlled pastries and desserts acknowledged by all authorities as necessary to nutrition.

The plans included in this brochure will be of material assistance in the discussion of kitchen design and equipment. While space prevents the inclusion of many other excellent layouts, those presented constitute a representative cross-section of types. A good kitchen plan is the product of the right type of equipment and experienced kitchen design. Your kitchen equipment house can furnish both.

●

THE G. S. BLODGETT CO., INC.

50 LAKESIDE AVENUE, BURLINGTON, VERMONT

BLODGETT — Makers of Fine Ovens Since 1848

OVENS ACTUALLY DESIGNED BY FOOD DIRECTORS

The flexible design and large capacity of Blodgett Baking and Roasting Ovens are the result of long and careful investigation of the requirements of school cafeterias.

Actually, these ovens were designed by food directors who wanted efficient, space-saving equipment, so easily operated that there would be no need for long, detailed instruction every time an employee changed. They wanted easily read thermostat dials and accurate control, coupled with large capacity. They wanted to reduce the fatigue due to the bending, stooping and lifting required by old-style, conventional equipment.

To "dress up" dishes, such as individual casseroles, and to produce in quantity, without loss of quality, requires equipment specifically designed for mass production of nutritious foods. Blodgett's "just-short-of-a-century" experience in oven manufacture has produced all these features—and more!

BLODGETT OVENS AND MEAT COOKERY

Jessie Alice Cline points out in recently published articles on meat cookery that two of the factors that effect shrinkage—cooking temperature and degree of doneness—can be controlled in the kitchen. Cooking temperature is easily controlled in Blodgett sectional roasters, and the five points named by Miss Cline as the advantages of constant oven temperatures are easily achieved, namely: "(1) less shrinkage; (2) less fuel; (3) easy to control and to duplicate; (4) less watching; (5) less spattering and burning of fat, pans and racks."

Not only can meats, fish and poultry be done more easily when removed from beneath the range tops, but many foods, such as casserole dishes, stews, baked hamburgers, bacon and the like, are more easily prepared, **and with huge savings!**

BLODGETT OVENS AND VEGETABLE COOKERY

Vegetables essential to the "Basic 7" nutrition program are now easily prepared in sectional ovens, with greater appetite-stimulating attractiveness. Literally hundreds of dishes rarely attempted before, because of equipment limitation, are now common menu items. Individual casserole dishes, spinach loaf, baked celery, summer squash, baked tomatoes, baked carrots, baked corn, eggplant, baked parsnips, onions, potatoes, turnips, and au gratin dishes are but a few. In addition, a large number of meat substitutes are now easily prepared, thanks to the large capacity and facile operation of Blodgett Roasting or Baking Ovens.

BLODGETT OVENS AND BAKING

Authorities state that desserts are as important to good nutrition as the principal food items themselves. Premises-controlled desserts, prepared under the supervision of the school dietitian, meet exactly the nutritional requirements of students. **Adequate menu variation** of desserts and the ever-popular hot breads and biscuits, so essential to school nutritional programs, are assured. Blodgett Sectional Ovens, with their separate controls, actually function as **two or more** ovens in the same floor space—producing with variety, quality—and on time!



No 1 THIS COLLEGE KITCHEN FEEDS 800 STUDENTS

This plan was conceived to feed 800 persons at the Nurses School, Adelphi College, Garden City, New York. It was designed by A. J. Amendola of Nathan Straus-Duparquet, Inc. and installed by the Federal Manufacturing Co., Brooklyn, New York.

Equipment Used

(a) 1 NO. 959 BLODGETT COMBINATION BAKING AND ROASTING OVEN
(b) 1 gas-fired hot plate
(c) 1 vegetable steamer
(d) 2 stock kettles
(e) 1 gas-fired solid top range
1 gas-fired fry top range
1 gas-fired salamander
(f) 1 gas-fired deep fat fryer

An interesting feature is the space allotted for **future** equipment. The basic menu consists of one soup, a main hot dish, vegetable plate, three salads, three sandwiches, several desserts, beverages. Three meals daily are served to students, faculty and staff.



PRATT INSTITUTE, Brooklyn, New York, serves 300 students daily with this battery of equipment. A major unit is the No. 963 Blodgett Oven, used simultaneously for baking and roasting.

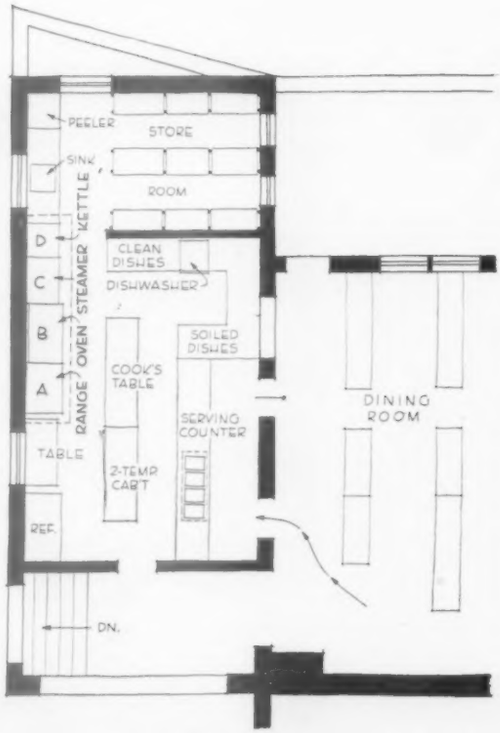
No 2 "SPECIALIZED COOKING TOOLS" IN A MARYLAND HIGH SCHOOL

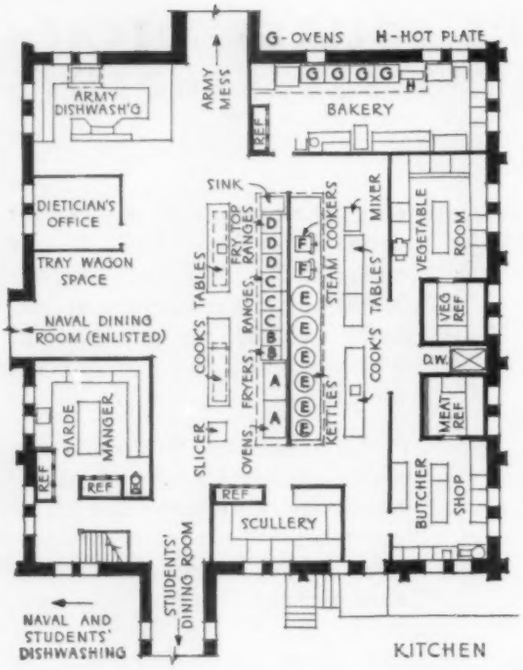
This Cumberland, Md., high school kitchen, an excellent example of modern "cooking tool" layout, was designed and installed by the Bernard Gloekler Corporation, Pittsburgh, Pa.

The flexibility of modern equipment and the excellence of kitchen design incorporated in this plan permits the serving of substantial hot meals to 600 students daily, with clocklike precision. All cooking functions except the baking of bread are performed on premises.

Equipment Used

(a) 1 gas-fired heavy duty range
(b) 1 No. 959 BLODGETT GAS-FIRED BAKING AND ROASTING OVEN
(c) 1 vegetable steamer
(d) 1 stock kettle





No 3

A COLLEGE SERVES 6000 DAILY MEALS

This kitchen space was redesigned and its equipment installed by A. Mathesius of H. F. Rutley Company, Inc., Brooklyn, New York, according to the plan at left, to increase the food services from a few hundred daily to more than 6000.

The basic menu consists of two soups, 1 meat, 2 vegetables, hot breads, desserts and beverage. The two No. 952 Blodgett Gas-Fired Roasting Ovens accommodate 800 lbs. loading capacity in four separately controlled sections. The four Blodgett Gas-Fired Multiple Deck Ovens furnish ample and flexible capacity for premises-controlled baked goods and desserts.

Equipment Used

(a) 2 No. 952 BLODGETT GAS-FIRED ROASTING OVENS
(b) 2 gas-fired fryers
(c) 3 gas-fired ranges
(d) 3 gas-fired fry tops
(e) 6 stock kettles
(f) 2 vegetable steamers
(g) 4 BLODGETT GAS-FIRED BAKE OVENS
(h) 1 gas-fired hot plate



U. S. NAVAL TRAINING STATION (WR), Bronx, New York, used this battery of five No. 959 Blodgett Ovens to furnish efficient and adequate roasting capacity for 17,000 husky naval meals daily.

No 4

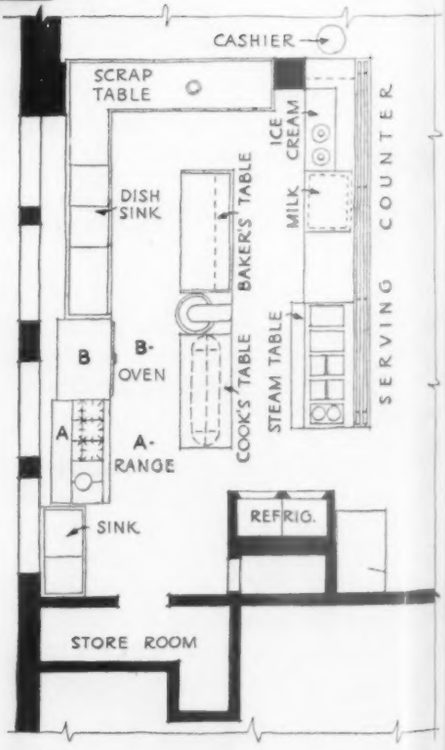
A SMALL SCHOOL FEEDING UNIT

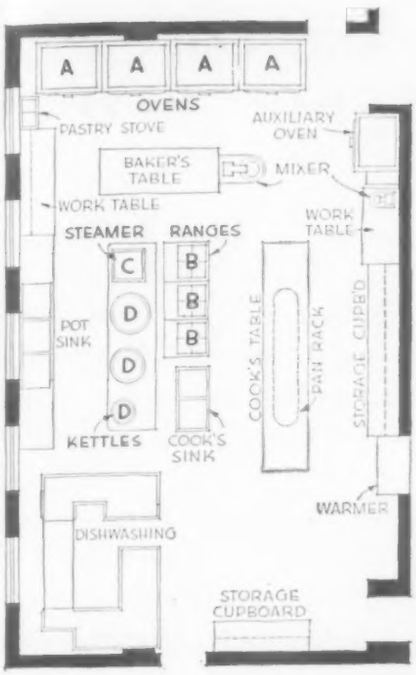
Kitchen plan of Guilford School, Cincinnati, Ohio, designed by H. Lauber & Co., Cincinnati, Ohio.

Feeding 300 school lunches daily, with a basic menu consisting of soup, meat, fish or meat substitutes, three vegetables and two to three desserts, is an easy matter with this flexible, modern kitchen layout. The No. 932 Blodgett Oven is used for baking, roasting, vegetable cookery and pudding work.

Equipment Used

(a) 1 solid top gas-fired range
1 open top gas-fired range
(b) 1 No. 932 BLODGETT GAS-FIRED BAKING AND ROASTING OVEN





No 5 HIGH SCHOOL SERVING 4300 STUDENTS DAILY

To serve 4300, of whom 2490 (58%) eat hot meals, this kitchen at Withrow High School, Cincinnati, Ohio, was designed and installed by H. Lauber & Company, Cincinnati, Ohio.

Equipment Used

(a) 4 four-compartment, two-section BLODGETT GAS-FIRED BAKING AND ROASTING OVENS.

(b) 3 open top gas-fired ranges

(c) 1 vegetable steamer

(d) 3 stock kettles

The basic menu consists of soup, two meats, potatoes, potato substitutes, 3 vegetables, 8 to 18 salads, 5 or more sandwiches, 3 to 5 pies, cake, custard, two or more puddings, fresh fruits, ice creams and jello.



FOOD TRADES VOCATIONAL HIGH SCHOOL, New York, recognizes the importance of modern equipment, as well as modern methods. This battery of Blodgett Ovens is used for training student bakers.

COMPACT KITCHEN AT THE UNIVERSITY OF VERMONT No 6

Incorporating highly specialized cooking and service "tools," this kitchen at Robinson Hall, University of Vermont, was designed by H. P. Rung, kitchen equipment consultant of Nathan Straus-Duparquet, Inc., New York.

Serving several hundred students daily the following basic menu is used: one soup, one meat, one entree, three or four vegetables, rolls, muffins, cake, pies, baked desserts, baked custards, cooked fruit, jello and beverages.

Equipment Used

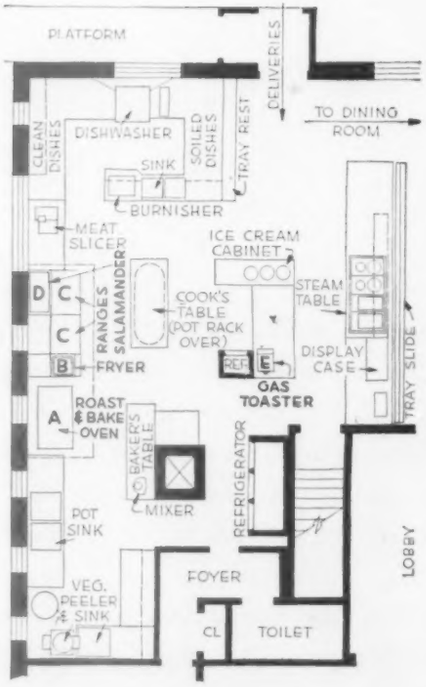
(a) 1 No. 959 BLODGETT GAS-FIRED ROASTING AND BAKING OVEN

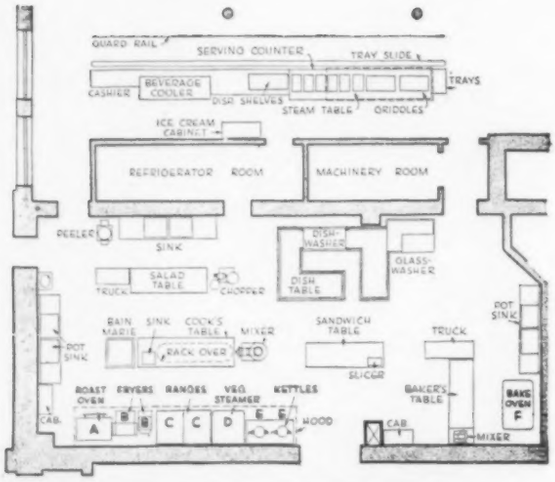
(b) 1 gas-fired deep fat fryer

(c) 2 heavy-duty gas-fired ranges

(d) 1 gas-fired salamander

(e) 1 gas-fired toaster





Equipment Used

(a) 1 No. 952 BLODGETT GAS-FIRED ROASTING OVEN
(b) 2 gas-fired deep fat fryers
(c) 2 heavy-duty gas-fired ranges
(d) 1 vegetable steamer
(e) 2 trunnion kettles
(f) 1 No. 982 BLODGETT GAS-FIRED BAKING OVEN

No 7 CHICAGO HIGH SCHOOL KITCHEN DESIGN

This kitchen at the Englewood High School was designed by the Board of Education, City of Chicago. John C. Christanson, architect, working with F. O. Washam, Director of Lunchrooms, laid out the plan. Alex Janows & Co., Chicago, installed the equipment.

With its modern layout and equipment, this highly flexible kitchen serves 3,100 students one hot meal each school day. Daily menus are highly diversified and include roasts, meat substitutes, fish, baked vegetables, pies, cakes, hot breads, rolls, muffins, and pastries. Outstanding feature of the menu is the constant variation and attractiveness of the dishes.



Major unit of this modern, gas-fired cooking equipment, which replaced a 6' stoker-fired coal range at Manhattan College, Bronx, N. Y., is this No. 952 Blodgett Roasting Oven. Baking is handled in a separate bakeshop by a Blodgett Baking Oven.

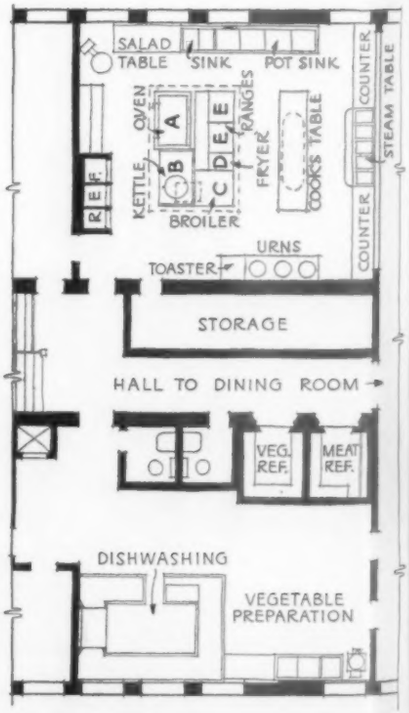
No 8 SUCCESSFUL UTILIZATION OF VERY LIMITED SPACE

Kitchen of Marmion Military Academy, Aurora, Ill., designed by the Stearnes Company of Chicago, Ill.

Serving approximately 1000 meals daily to 350 students, it exemplifies the flexibility and large capacity of modern equipment—factors which make feasible the efficient utilization of limited floor space. The roasting section of the oven, for example, is equipped for the use of an extra removable shelf which doubles the compartment capacity.

Equipment Used

(a) 1 No. 959 BLODGETT GAS-FIRED BAKING AND ROASTING OVEN
(b) 1 stock kettle
(c) 1 gas-fired broiler
(d) 1 gas-fired fryer
(e) 2 gas-fired ranges



SECTIONAL GAS-FIRED OVENS DESIGNED TO FIT THE JOB!

THE COOKING JOB

There are literally hundreds of dishes on school menus today for which the large capacity, extreme flexibility and easy operation of the sectional roasting oven may take credit—dishes that would be, to say the least, difficult to prepare, or lacking in student appeal, without these efficient units.

More savory roasts with considerably more portions per pound, casserole dishes, baked vegetables, oven-prepared "gravy meats," oven-done bacon, fish, hamburgers and dozens of puddings are now **quantity**-produced with ease and profit.

These ovens are labor-saving; they eliminate fatigue caused by unnecessary lifting, stooping and bending, as well as knee-high heat discomfort. They save floor space and cut down fuel cost and ventilation requirements. Functioning under accurate heat control, each section can be depended upon for continuously recurring exactitude in results.

In all school feeding installations—small or large, high school or college, rural or metropolitan, urban or surburban—bakeshops should be planned as an integral part of the feeding operation.

THE BAKING JOB

All authorities agree upon the importance of desserts to the diet; the value of good rolls, biscuits, hot breads and muffins would be questioned by few. Premises-controlled, freshly baked products stimulate appetite and make otherwise wearisome menus satisfying.

In hundreds of installations, from small schools where roasting and baking are combined in single units to large high schools and colleges, Blodgett Sectional Gas-Fired Ovens are in daily use, providing a high percentage of the nation's schools with premier puddings, desserts and rolls and breads.

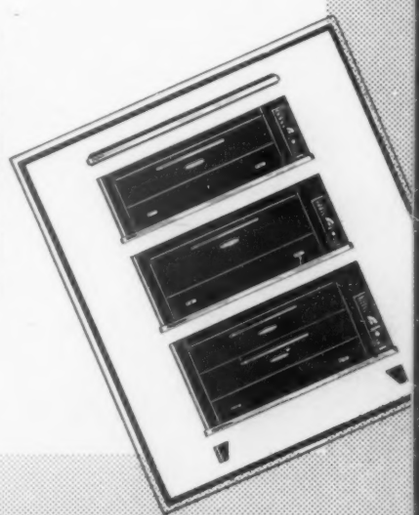
Blodgett Ovens are designed around three basic oven sections in two shelf sizes:

	Shelf Size A	Shelf Size B
Single 7" compartment	33" x 22"	42" x 32"
Double 7" compartment	33" x 22"	42" x 32"
Single 12" compartment*	33" x 22"	42" x 32"

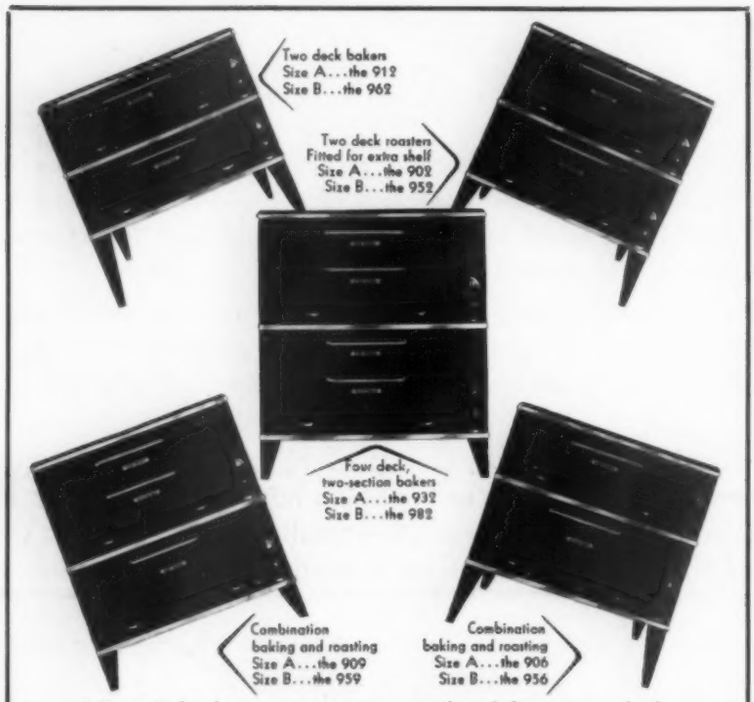
*Fitted for extra removable shelf

THE KITCHEN-BAKESHOP DESIGN

The advantage of this design lies in the fact that the kitchen designer may now "tailor-make" an installation exactly to suit requirements, and yet use standard equipment with which to do it. These combination baking and roasting ovens do away with the onerous task of roasting and vegetable cookery beneath range tops and in its place, provide the ease, convenience and unexcelled flexibility of oven operation for baking and dessert preparation.



TEN POPULAR BLODGETT OVENS



All 12" high compartments are fitted for extra decks.

There are twenty-two models—each formed from one or more of Blodgett's "BASIC THREE" sections—designed to meet every cooking need.

You may select the proper oven for your needs from one of the following:

Cata. No.	Shelf Size	Number of Compartments	Number of Controls
911	A	1...7"	1
961	B	1...7"	1
912	A	2...7"	2
962	B	2...7"	2
913	A	3...7"	3
963	B	3...7"	3
931	A	2...7"	1
981	B	2...7"	1
932	A	4...7"	2
982	B	4...7"	2
910	A	3...7"	2
960	B	3...7"	2
901	A	1...12"	1
951	B	1...12"	1
902	A	2...12"	2
952	B	2...12"	2
		2...7"	
909	A	1...12"	2
		2...7"	
959	B	1...12"	2
		1...7"	
906	A	1...12"	2
		1...7"	
956	B	1...12"	2
		2...7"	
907	A	1...12"	3
		2...7"	
957	B	1...12"	3

A...33" x 22" shelves
B...42" x 32" shelves

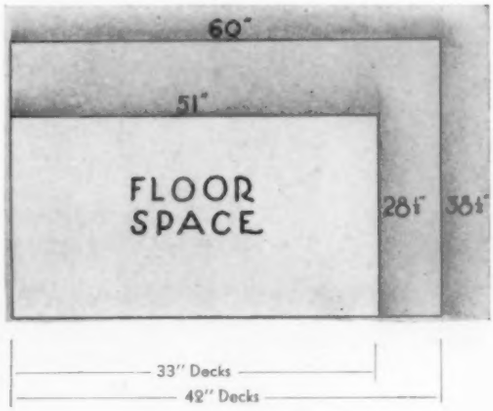
: GENERAL DATA ON BLODGETT OVENS :

Capacities of Ovens	33"x22" deck	42"x32" deck
10" pie tins	6	12
18 x 26 bun pans	1	2
1 lb. loaves	12	24
9 x 7 roll pans	9	16
19 x 4 pullman loaves	8	14
Cup tins (13 x 10½)	4	9
#200 steam table pans	2	4
#3 bean pots	8	20
5" round casseroles	24	48
Potatoes #60	30	60
Potatoes #140	70	140
Roast pans (standard)	1	2

To ascertain capacity of any oven, multiply number of decks in unit by capacities for appropriate sizes listed above. All 12"-high compartments are equipped for an extra, removable shelf.

Blodgett Ovens use manufactured, natural, mixed or liquefied petroleum gases. When ordering, specify type of gas, Btu. content, specific gravity and pressure. Maximum gas input is as follows: 33" x 22" x 7" section—20,000 Btu.; 33" x 22" x 7" double sections—27,000 Btu.; 33" x 22" x 12" section—22,000 Btu.; 42" x 32" x 7" section—36,000 Btu.; 42" x 32" x 7" double sections—41,000 Btu.; 42" x 32" x 12" high section—38,000 Btu.

Sections are crated separately. Minimum entry clearance required for each section is as follows: 7" high sections—22 ⅛"; 12" high section—27 ⅛"; two deck section—31 ½".



The G. S. BLODGETT CO., Inc.

50 LAKESIDE AVE. BLODGETT BURLINGTON, VT.

EDISON GENERAL ELECTRIC APPLIANCE COMPANY, Inc.

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Modernize with Hotpoint-Edison for greater kitchen efficiency!

SCHOOLS demand the greatest possible kitchen efficiency—with a minimum of labor. Hotpoint-Edison Electric Cooking Equipment meets both requirements.

This equipment is especially suitable for school kitchens because it is long-lived and dependable. QUALITY is built into every vital part. Accurate Automatic Temperature Controls guard against waste, avoid burning or drying out foods and enable a smaller crew to handle increased production capably. Compactness, cleanliness, coolness and convenience are other advantages of cooking electrically and economically with Hotpoint-Edison equipment. For further information, consult your local distributor or write to us.



K-46 Electric Fry Kettle
"Heat Manager" Automatic Temperature Control. Simplified sediment removal cup. Fat capacity, 60 pounds. 36-in. high, 24-in. wide, 36-in. deep. Connected load 18-KW.



Electric Bake Oven N-222
Dual control of top and bottom heat in each deck. Connected load 8.4 KW. 70-in. high, 54 3/8-in. wide, 38 3/16-in. deep. Capacity, 4 roll pans (18 x 26-in.)



Diet Kitchen Electric Range R-200
Available with cast-in round units or two sizes of Automatic Griddles. Connected load 12-KW. 32-in. high, 30-in. wide, 32-in. deep.



"Custom-Top" Electric Range R-171
Available with cast-in round units or two sizes of Automatic Griddles. Connected load 21-KW. 32-in. high, 36-in. wide, 38-in. deep.

Dependability Assured by 40 Year's Experience!

OLDEST AND LARGEST MANUFACTURERS OF ELECTRIC COOKING EQUIPMENT

Hotpoint Edison

SOLD THROUGH LEADING KITCHEN EQUIPMENT DISTRIBUTORS

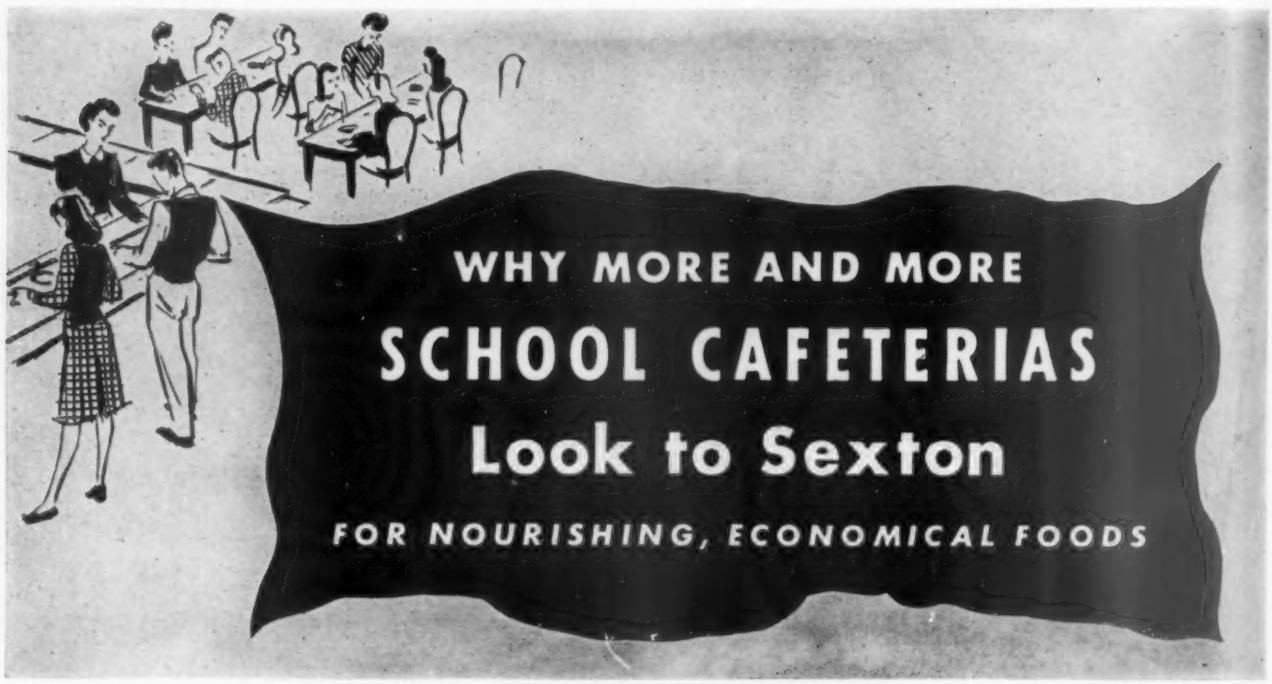
COMMERCIAL ELECTRIC COOKING EQUIPMENT

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JOHN SEXTON & CO.

Manufacturing Wholesale Grocers

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TODAY, school cafeteria buyers have found that good food costs less, especially in feeding children and teen-agers. There is no waste in serving food of the same fine quality that is featured in the leading hotels and restaurants. There is no extra cost for the assurance gained by serving food of the same purity as that served by the most exacting hospital.

Sexton foods are prepared exclusively for those who serve many people each day. This specialization makes dealing at Sexton's pleasant, convenient and satisfying. Sixty-three years of dependable service are back of every purchase.

A Sexton salesman calls in your town at least every other week. If he has not been in to see you, please drop us a card and we will have him call.

JOHN Sexton & co.

Manufacturing Wholesale Grocers

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VEGETABLE JUICES
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***GELATINE DESSERTS**
6 Exquisite Flavors

***PUDDING DESSERTS**
6 Delicious Flavors

***PUDDING SAUCES**
Taste Delights

***BAKING REQUISITES**
of All Kinds

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FLOURS, PREPARED
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Every Kind—Whole or Ground

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***FOUNTAIN SYRUPS**
10 Delightful Flavors

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JOHN Sexton & CO.

Manufacturing Wholesale Grocers

CHICAGO • BROOKLYN • DALLAS • ATLANTA • PITTSBURGH

THE CLEVELAND RANGE CO.

Cleveland 14, Ohio

STEAM-CHEF STEAM COOKERS

for all School, College and Institution Kitchens. Direct Steam—Gas—Electric Operation

IN HUNDREDS of leading educational institutions STEAM-CHEF takes a big part of the cooking burden, saves times, space, work and fuel. It is simple for anybody to operate, always ready for use, frees your range top for other purposes, and can be used for a great variety of foods. It cuts down your use of pots and pans, eliminates boiling over, also scorched foods and cooking vessels. Many STEAM-CHEF owners use their steamers for canning seasonal fruits and vegetables.

The basic dietary advantages of the steaming process are familiar to all authorities, who recognize that this method assures food which is both more nourishing and more appetizing, since vitamins and other essential values, as well as natural flavor, texture, and appearance, are better conserved.

There is a STEAM-CHEF model of the correct size and type to fit your exact cafeteria requirements. Some connect directly to a central steam line. Others generate their own steam with gas or electricity. Steam is the most economical cooking medium—STEAM-CHEF is the most efficient steamer.

Send for valuable booklet "For Better Steaming"



Body Construction — One-piece welded bodies of heavy plate steel, rust-proofed or stainless, easy to keep clean and sanitary, insuring low maintenance cost and extra-durability.

"Full Floating" Doors—An exclusive Steam-Chef feature, always seat perfectly, never require adjustments, prolong gasket life.

Safe Operation — Maximum safety results from doors which cannot be opened while steam is being admitted to compartment.

Synchronized Thermostatic Control—Achieves new economy and convenience. Eliminates necessity for steam vent line and cuts steam consumption 50% to 80%.

Automatic Control—of both fuel and boiler water level is provided on gas and electric units—an exclusive feature, effecting fuel saving of 33⅓%.

Sizes and Types—Over 50 models, sizes and types — capacities 2 to 7½ bushels per charge — standard units to fit practically any requirement.



Model 101-3B, Direct-connected typical 3 compartment style. The most popular size for average requirements. Capacity 6 bushels

Complete information and detailed specifications furnished on request. Sold through recognized kitchen equipment dealers everywhere.

Model 2SB, Steam-generating, gas operated, two compartment. Also available in direct-connected type Model 101-2B. Capacity 4 bushels

PROMINENT SCHOOL INSTALLATIONS

Tuskegee Institute, Tuskegee, Ala.
Stanford University, Palo Alto, Calif.
Georgia School of Technology, Atlanta, Ga.
Northwestern University, Evanston, Ill.
Purdue University, Lafayette, Ind.
Southern Baptist Theological Seminary, Louisville, Ky.
Southwestern Louisiana Institute, Lafayette, La.
Wellesley College, Wellesley, Mass.
Harvard University, Cambridge, Mass.
Michigan State College, East Lansing, Mich.
Wayne University, Detroit, Mich.
Stephens College, Columbia, Mo.
Dartmouth College, Hanover, N. H.
Princeton University, Princeton, N. J.
Cornell University, Ithaca, N. Y.
Adelphi College, Garden City, Long Island, N. Y.
Fordham University, New York City
Hunter College, New York City
Barnard College, New York City
Vassar College, Poughkeepsie, N. Y.
Skidmore College, Saratoga Springs, N. Y.
Syracuse University, Syracuse, N. Y.
Duke University, Durham, N. C.
State Teachers' College, Minot, N. D.
Baldwin-Wallace College, Cleveland, Ohio
Louis Pasteur Jr. High School, Los Angeles, Calif.
John Burroughs Jr. High School, Los Angeles, Calif.
Bret Harte Jr. High School, Los Angeles, Calif.
Canterbury School, New Milford, Conn.
Admiral Farragut Academy, St. Petersburg, Fla.
Groton School, Groton, Mass.
Cranwell Preparatory School, Lenox, Mass.
Abbott Academy, Andover, Mass.
Phillips-Exeter Academy, Exeter, N. H.
Blair Academy, Blairtown, N. J.
Edgewood High School, Ashtabula, Ohio
Schneider School, Columbia, S. C.
Bremerton High School, Bremerton, Wash.
Oberlin College, Oberlin, Ohio
Wooster College, Wooster, Ohio
University of Tulsa, Tulsa, Okla.
Villanova College, Villanova, Pa.
Bryn Mawr College, Bryn Mawr, Pa.
Allegheny College, Meadville, Pa.
Bucknell University, Lewisburg, Pa.
A. & M. College of Texas, College Station, Tex.
Brigham Young University, Provo, Utah
Middlebury College, Middlebury, Vt.
Virginia Polytechnic Institute, Blacksburg, Va.
College of William & Mary, Williamsburg, Va.
Davis-Elkins College, Elkins, W. Va.

STATE UNIVERSITIES OF

Arkansas, California, Colorado, Connecticut, Delaware, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Michigan, Minnesota, Missouri, Montana, Nebraska, New Hampshire, New Mexico, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, Texas, Utah, Vermont, Virginia, Washington, Wisconsin, Wyoming

For BETTER Steaming— STEAM-CHEF

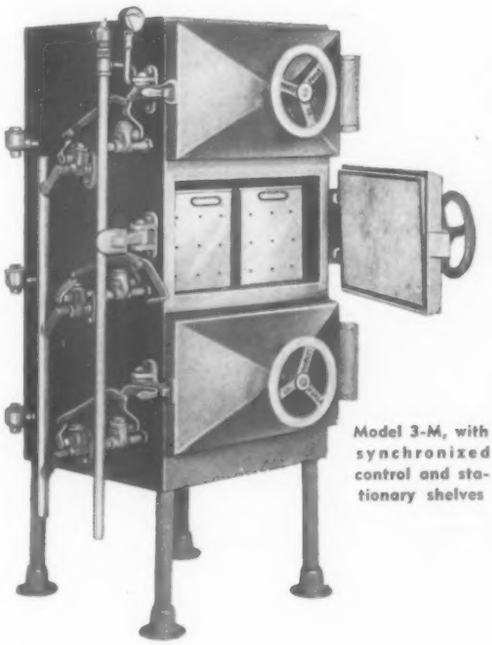
MARKET FORGE COMPANY

Everett Station Boston 49, Mass.

ECONOMY WITH BETTER DIETETICS

WITH THE MARKET FORGE

COMPARTMENT STEAMER



Model 3-M, with synchronized control and stationary shelves

Market Forge Company's low-pressure compartment steamers prepare entire menus with less labor, greater economy, and dietetically superior. Steam cooking preserves natural flavor and food values. Fabricated of non-corrosive metals and designed and built to last a lifetime, these steamers are available (at once) in models and sizes to conform with your needs and the available fuel supply — for direct steam connection, or for gas or electric operation.

SIX POINTS OF OUTSTANDING ADVANTAGE FOR SCHOOL CAFETERIA COOKING

RECENT INSTALLATIONS
Schools and Colleges

An Interesting List of
MAFORCO
Installations

Yale University
New Haven, Conn.
Harvard University—Cowie Hall
Cambridge, Mass.
Stevens Institute of Technology—Cafeteria
Hoboken, N. J.
Lehigh University—Cafeteria
Hartford, Conn.
Vanderbilt University—Cafeteria
Nashville, Tenn.
Princeton University
Princeton, N. J.
University of Missouri
Columbia, Mo.
University of Pittsburgh—Cafeteria
Pittsburgh, Pa.
Cornell University
Ithaca, N. Y.
Whitman College
Walla Walla, Washington
Washington & Lee University
Lexington, Va.
University of Kansas
Lawrence, Kan.

1. **Insulated door fronts.** Completely sanitary; cannot heat.
2. **Seamless, stainless steel baskets.** Rounded corners; easy to clean.
3. **Automatic sliding shelves.** Baskets roll out when door is opened.
4. **Free-floating inner door.** Always seals perfectly; cannot leak.
5. **Advanced steam controls.** Steam is exhausted before door can open.
6. **Automatic gas controls.** Trouble-free; also approved boiler.

Steam cooking is simple, and requires no trained operator to handle the steamer competently. Save fuel, food, time and labor with a Market Forge steamer.

Have you read our latest brochure on steam cooking? A copy will be sent on request.



SAVORY
EQUIPMENT, INC.
133 Pacific Street, Newark 5, N. J.



NOW!
stainless steel
SAVORY TOASTERS

with all of these great, exclusive advantages:

1. **FAST TOASTING;** 6 to 12 slices per minute, every minute, to assure speedy service to your patrons.

2. **EASY AND CONVENIENT AUTOMATIC OPERATION;** saves labor; compact design saves space; automatic controls save fuel and provide operating costs as low as a few pennies per hour.

3. **STURDY CONSTRUCTION;** utilizing aluminized steel interior parts plus simplified design, adds years to operating life and assures extremely low maintenance costs.

4. **BEAUTY;** the polished stainless steel exterior casing adds distinction to your installation.

5. **MODELS TO FIT ALL NEEDS;** gas operated or all-electric units for toasting bread, buns and sandwiches.

PLACE YOUR ORDER NOW WITH YOUR REGULAR EQUIPMENT DEALER.

The new stainless steel Savory toaster will be available soon.

VULCAN

STREAM-LINE Gas Cooking Equipment

DESIGNED AND MANUFACTURED FOR

SCHOOLS, COLLEGES and UNIVERSITIES



STANDARD GAS EQUIPMENT CORPORATION

BAYARD & HAMBURG STREETS, BALTIMORE 30, MD.

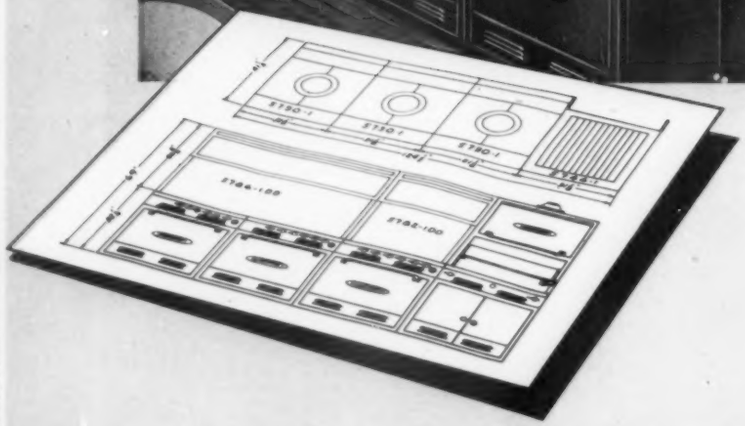
BRANCH OFFICES: NEW YORK • BOSTON • AURORA, ILL. • CHICAGO • NEW ORLEANS • LOS ANGELES

GOOD FOOD SERVICE STARTS



A study of the cooking needs of this institution showed the need for three VULCAN super-radial fin top ranges for stock and boiling. Each has an extra large, two compartment insulated oven equipped with automatic heat controls. Because of accurate control over roasting temperatures, meat losses due to shrinkage have been greatly reduced and savings in food and fuel are substantial. Heavy-duty ceramic broiler with au gratin oven provides excellent broiling facilities.

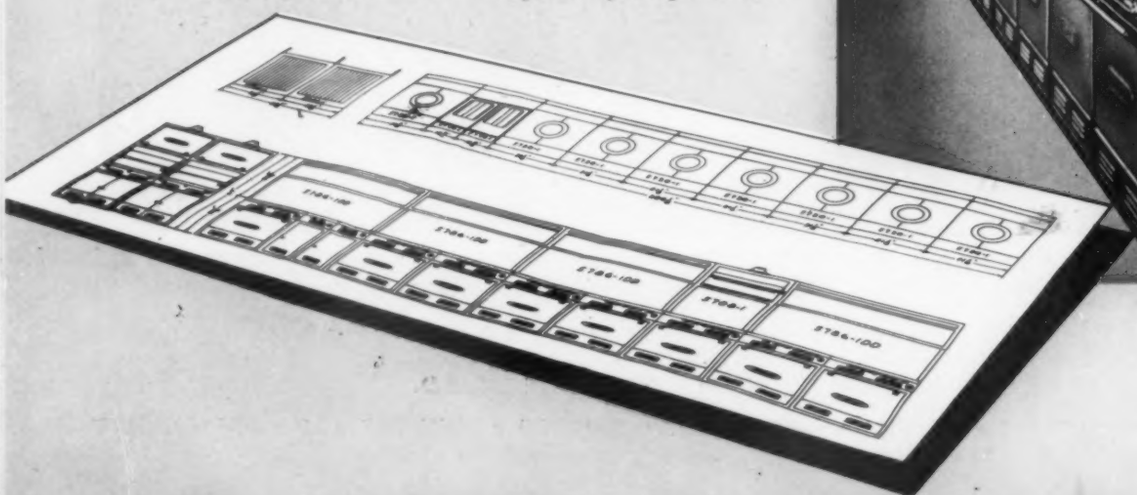
A preliminary survey was made —layouts were made in blue-print form. When the equipment was delivered it fitted perfectly in the space and is operating with complete satisfaction.



The cooking requirements here are adequately handled by two heavy-duty ceramic broilers at the far end. Two deep-fat fryers with automatic temperature controls are inserted between the broiler and the line-up of seven super-radial fin top ranges. In other kitchens skeleton top ranges can be substituted and oven capacity can be provided by installing one or more VULCAN roasting ovens, or sectional ovens as shown on back page of this insert. This latter method is often preferred when women cooks operate the equipment.

Again, in this case, the cooking requirements were carefully studied and a blueprint layout presented.





AT YOUR KITCHEN RANGES!

VULCAN GAS COOKING EQUIPMENT

To cook food well, your cooking crew needs good tools, the kind of tools you'll find in VULCAN gas cooking equipment. A well-balanced installation of the VULCAN cooking units shown here will give unsurpassed cooking facilities. With them your cooking crew will have the advantages of greater efficiency in top cooking service—better broiling facilities—instant, uniform, controlled heat—improved, insulated roasting and baking ovens—also scientifically designed frying equipment with automatic heat controls. The result will be better quality of food, lower cooking costs, more variety in menus, and increased dietetic value.

VULCAN SERVICE TO SCHOOLS

Every school's food service facilities must be planned to meet its individual requirements. Cooking equipment, too, must be specially selected to meet its specialized food service needs. VULCAN Planning Service is set up to provide expert guidance in selecting the best combination of ranges, broilers, ovens and specialized cooking units to meet each school or university's food service demands. On the opposite page are typical layouts produced by this service department. Below are additional hookups showing other practical combinations of VULCAN cooking units, each designed to meet special cooking requirements.

If you are planning new construction or remodelling your present facilities ask for full information about this helpful planning service and ask for a complete catalog of VULCAN cooking equipment. Write today, there is no obligation.



This typical VULCAN installation for a school cafeteria provides facilities for serving more than 1000 students per day. Shown in the illustration are: Two Super Radial Fin Hot Top ranges for ample top capacity . . . Elevated ceramic broiler . . . Two-burner Expando unit with storage compartment . . . Deep fat fryer and . . . Heavy-duty ceramic broiler with au gratin oven . . . Two large, insulated, heat-controlled ovens. All mounted on toe base. Width 124⅝ inches.



The flexibility of VULCAN cooking equipment is further demonstrated by the combination of a heavy duty ceramic broiler for broiling and toasting; Two large super-radial fin hot top ranges for stock or boiling operations; Two-burner open top; Two extra large, two-compartment, insulated, heat-controlled ovens; High shelf; Storage compartment. Complete unit is mounted on toe base. Width 109 inches.



The improved radial fin top, introduced and patented by VULCAN, has made possible savings of 20% in fuel consumed in the range top. The new ventilated ring and lid, as well as angle-drilled burner, gives increased center heat for faster heating. New blue-flame pilot lights any or all rings—really makes a 5-ring burner.



Another new VULCAN development, the Expando unit, makes it possible to add top capacity at low cost—and to retain the streamline appearance of a battery. This VULCAN feature gives flexibility. There are several types of Expando units available which fit in battery with other VULCAN ranges and equipment.



The new VULCAN deep fat fryer uses half the frying compound formerly required—gives the same high capacity service. This is made possible through increasing the area of the heat radiating surface—and incorporating in the unit a new and improved burner and heat control which assure faster heat recovery and economy.



The new VULCAN Ceramic Broiler has extra speed, large capacity and elevated oven for finishing or warming. A new Ceramic burner, with balanced heat, has been designed, retaining the speed of the ceramic burner, but improving the color of steaks, chops, fish, etc., thus meeting the requirements of exacting chefs.



The VULCAN Roasting Oven can be connected in battery as an integral or separate unit—and thus gives oven capacity of two ranges in floor area required for one. This arrangement permits a more efficient food production layout. This unit is especially useful when large oven capacity is needed and space is limited.



In the VULCAN Sectional Oven added roasting and baking capacity can be obtained by using wall space instead of adding to the floor space. The VULCAN Sectional Oven has separate burners and automatic heat controls for each deck so that roasting and baking can be done simultaneously on different decks at different temperatures.

MORE THAN 50 YEARS OF SERVICE TO SCHOOLS

VULCAN gas cooking equipment has successfully provided flexibility, completeness and unexcelled service to schools and universities for more than 50 years. The VULCAN line of gas cooking equipment includes practically every cooking unit needed for these specialized food service needs. All connections and designs are standard—and its installation, therefore, assures maximum operating efficiency with minimum operating and maintenance costs. When you install VULCAN you can rely on the same long-term superior service it is now giving to school and university kitchens from coast to coast.

Write to our VULCAN Planning Service—give us the essential facts on the job concerned. We will help you plan the layout of the cooking equipment and select the proper VULCAN units.

STANDARD GAS EQUIPMENT CORPORATION

BAYARD & HAMBURG STREETS, BALTIMORE 30, MD.

BRANCH OFFICES: NEW YORK · BOSTON · AURORA, ILL. · CHICAGO · NEW ORLEANS · LOS ANGELES

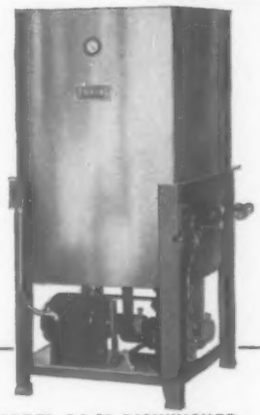
THE ANSTICE COMPANY, INC.

111 Humboldt St., Rochester 9, N. Y.

Rx *Modern Equipment*

FOR THE

MODERN SCHOOL



MODEL DS-50 DISHWASHER

Ideally suited to the institutional, cafeteria, or lunchroom kitchen. Length of washing period controlled by single lever. Available for either straight through (DS-50), or corner (DC-50), installation. 4000 pieces per hour.

DISHWASHERS

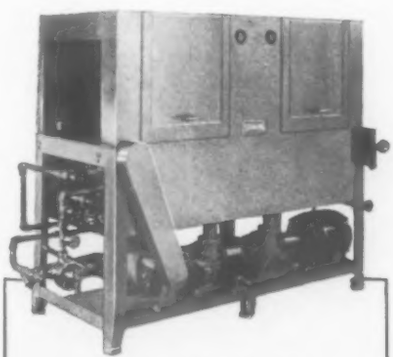
GLASS WASHERS ★ POTATO PEELERS

Illustrated are representative models of complete STERLING lines for all institutions—from smallest to largest.

Operating efficiency and, above all, quality manufacture are stressed throughout—attested by the large proportion of duplicate orders placed by hundreds of the largest and best-run institutions.

BUILT FOR *EXTRA* YEARS OF SERVICE

Note the relatively heavier and more rugged construction of STERLING equipment. STERLING operates one of the largest foundries in Western New York State. As a result, STERLING equipment can be built economically with a large proportion of heavy, long-wearing bronze castings.



MODEL 2A-100 DOUBLE TANK CONVEYOR DISHWASHER

Large capacity washer suited to the heavy duty requirements of hospital and institution main kitchens. 10,000 pieces per hr.

★ PROFIT BY FREE ANALYSIS OF YOUR PROBLEMS . . . If you are planning a new kitchen or new equipment for your old kitchen, request a complete analysis of the problems involved and their solution by a factory-trained STERLING Sales Engineer. Such analyses are offered without obligation on your part and may save you a great deal of time and money.

MODEL A-1-30 PEELER

Widely used in hospital and institution vegetable rooms. Patented "Wavy" disc of carborundum-fused-to-iron provides greatest possible efficiency.



STERLING

THE ANSTICE COMPANY, INC.

127 HUMBOLDT ST., ROCHESTER 9, N.Y.

Established 1884

CHAMPION DISH WASHING MACHINE CO.

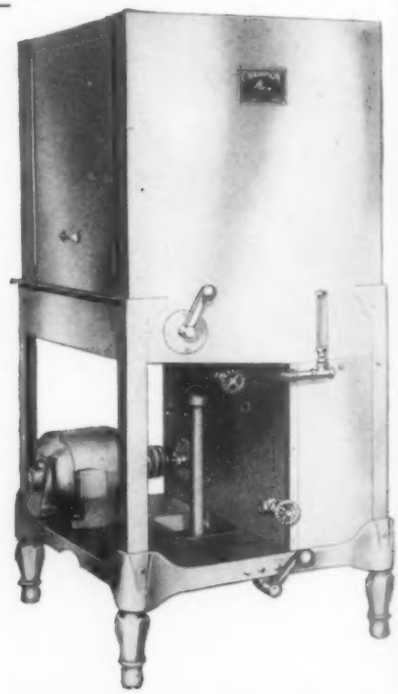
MAIN OFFICE AND FACTORY: ERIE, PA.

For the

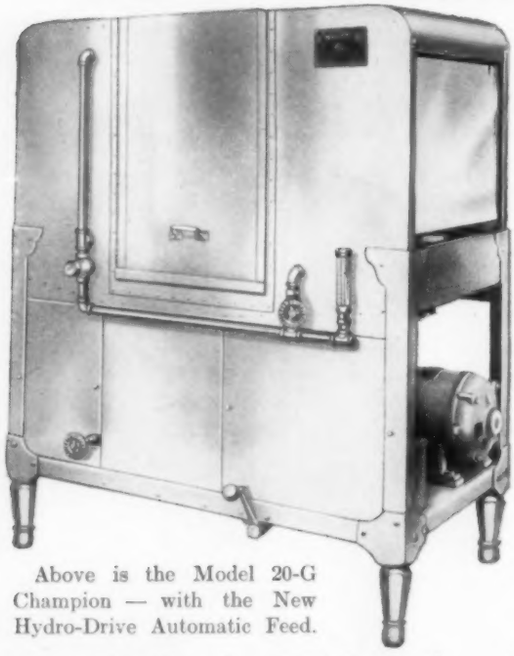
• Latest Improvements
• More Thorough Washing
• Unequalled Dependability

See the New

CHAMPION DISH WASHING MACHINES



At right is the Model 1-SD6 Champion, Single Tank, Rack Type, Hand Feed, with metal doors.



Above is the Model 20-G Champion — with the New Hydro-Drive Automatic Feed.

Every Kind of Feed: Rack Type, Hand Feed or Automatic—or Belt Conveyor.

Any Required Capacity from 50 racks or 800 dishes per hour, to 310 racks or 7,750 dishes per hour. (Belt Conveyor Champions to serve up to 2,000 persons per meal).

Faster, More Thorough Washing. The Champion's direct forceful sprays have the combination of pressure-plus-volume that gives cleaner dishes —faster. Hundreds of schools have given the Champion their enthusiastic endorsement.

"Lifetime" Tank of heavy cast iron, that will never wear out—and will never cost a cent for repairs.

"Non-Clog" Pump that doesn't need cleaning.

Automatic Feed of Dish Racks with the *Simplest* of Driving Mechanisms— the New Champion *Hydro-Drive*

It has the *fewest possible parts* — and they are airplane type parts that have been proved reliable in the most severe service.

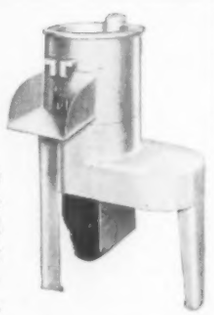
The drive is positive, all the way from the feed end to the clean dish table.

Hydro-Drive Champions are built in 4 sizes.

Every size Champion is built for Unequalled Dependability. Clean-cut design and rugged construction — with *extra strength at all critical points* — gives the user of any Champion extra insurance against interruptions.

The New

Champion Peeler has Splendid Features



Abrasive surfaces are Stainless Steel — the disc and cylinder have rustproof coatings (a special hard Ni-chrome Stainless). Self-locking door, that needs no gasket. Aluminum top cover. Write for folder.

Write us for help when you are planning improvements. An important part of our service is to provide a suitable layout for the space available.

FEARLESS DISHWASHER CO., INC.

Manufacturers of Dishwashers and Kitchen Equipment

Rochester 2, N. Y.

ESTABLISHED 1913

MODERN • EFFICIENT • DURABLE

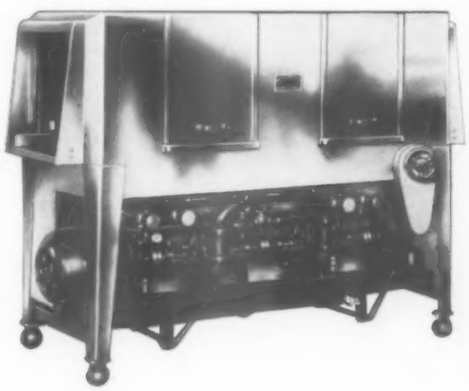
These words apply in every respect to FEARLESS Dishwashing equipment. Pioneers in the dishwasher field, this company, with more than forty years' experience in fabricating this equipment, has constantly kept pace with changing requirements and now offers equipment in harmony with the modern kitchen of today.

FEARLESS DISH-WASHER SYSTEM

Today's FEARLESS Dishwashers are easy to operate and are highly efficient. The dishes are sterilized—an advantage impossible when dishes are washed by hand.

Designed also by our Engineers are dish tables and other equipment with all of the modern conveniences.

All equipment is constructed to give long years of hard service.



TWO TANK AUTOMATIC CONVEYOR

For Schools Serving 1,000 or More

This double tank, fully automatic model is as easy to operate as any of the smaller models.

Wash and rinse tanks are separated by an air space so that independent water temperatures can be maintained. Suitable baffles prevent wash water from mixing with rinse water. A separate high volume centrifugal water pump is attached to each tank. Motor, pumps and worm drive reduction unit are mounted on the same cast iron base and direct-connected with flexible couplings. The conveyor chain is equipped with a positive action clutch that stops the chain if the racks jam in the machine. The machine is equipped with a final automatic rinse to insure immediate drying of the dishes. A beautiful, soundly engineered machine, this FEARLESS Dishwasher has no superior in simplicity and ease of operation, low operating cost and smooth, quiet operation. CAPACITY: 12,000 pieces per hour.

Write for complete specifications on either of these machines, or submit your special problems to us.

SINGLE TANK HAND FEED

For Schools Serving About 300 Per Meal

This single tank model featuring sturdy construction, simplicity of design, ease of operation, moderate cost and low operating expense is proving the most popular unit of its type on the market. Washing and rinsing operations are accomplished through use of a single lever conveniently located on the front.

See circular describing other special features.



THE HOBART MANUFACTURING COMPANY

The World's Largest Manufacturer of Food Machines

Troy, Ohio

Distributed by Hobart agencies in all principal cities—and all leading kitchen outfitters

Hobart Electric Kitchen Machines

Sales and Service offices in all Principal Cities

(*Consult Telephone Directory*)

HOBART MIXERS

In addition to the three mixers illustrated here, Hobart produces a range of models designed for every conceivable operation. They mix, beat, blend, whip, mash. With attachments they chop, grind, slice, shred, grate, crumb, sieve, strain, etc.

All Hobart mixers, regardless of size, feature exclusive Planetary Action—the most thorough, dependable, carefully-engineered mixing action ever developed.

HOBART POTATO PEELERS

New savings in time and food costs! Quiet, speedy and water-tight, these machines peel potatoes and all root vegetables quicker, with negligible peel loss. Sizes to handle any needs.

HOBART SLICING MACHINES

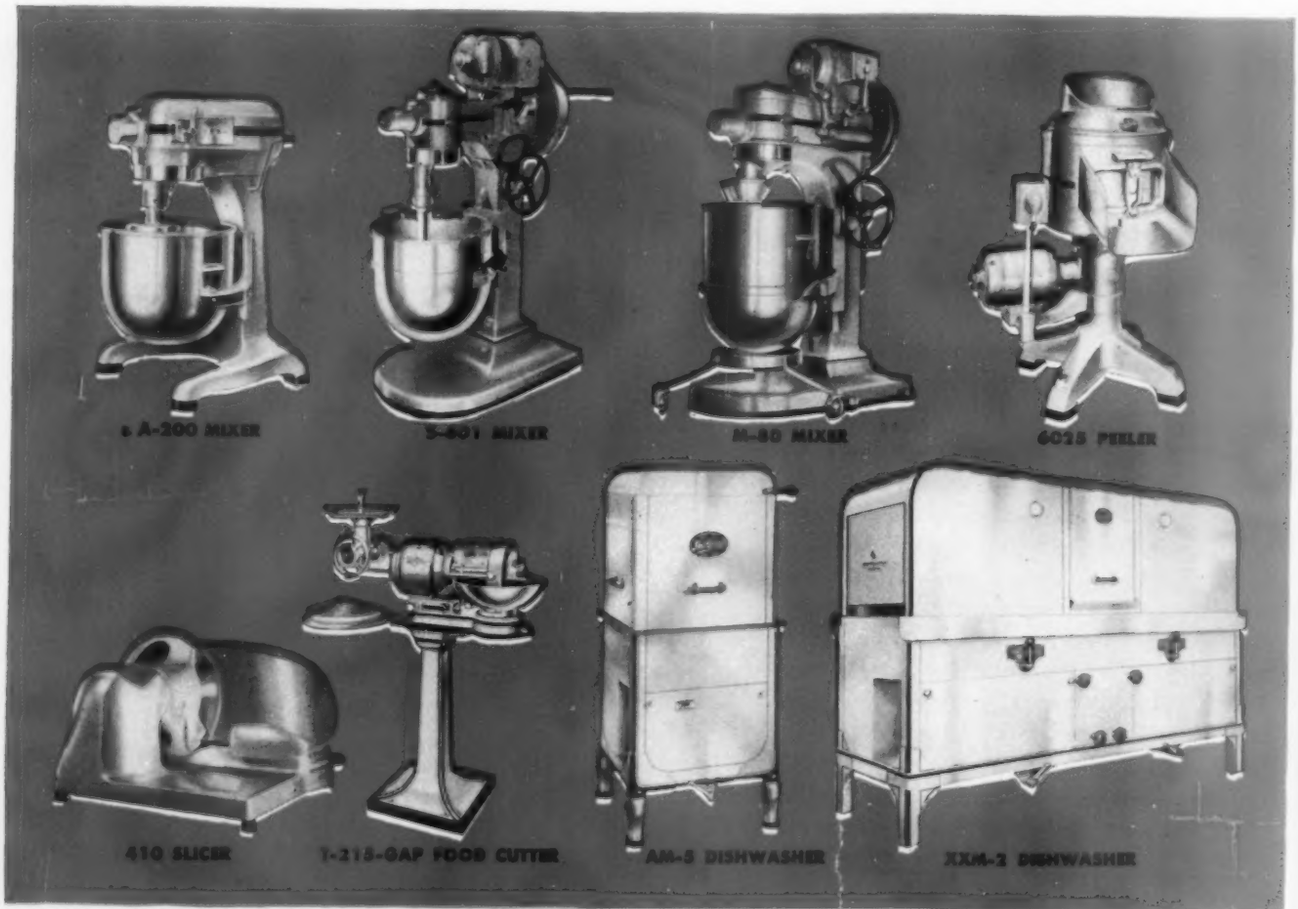
The Hobart Electric Ball Bearing Slicing Machine is ideal for all boneless meats, hot or cold, cooked or uncooked, bread, cheese, vegetables, fruits, etc. Convenient to operate, speedy, quiet, and easy to clean. Maximum safety. Hobart Stay-sharp Stainless Steel Knife.

HOBART FOOD CUTTERS

Featuring distinct advances in speed, thoroughness, safety, ease of cleaning, and economy of space. They cut and mix meats, vegetables, firm fruits, cocoanuts, citron, nuts, boiled eggs, beets—practically anything in the food line, uniformly in a few seconds' time.

HOBART DISHWASHERS

Automatic and semi-automatic models. Made in a complete range of sizes, for kitchens of *any* size. They wash all tableware *clean*, providing highest standards of sanitization in the shortest possible time. They carry such exclusive features as Revolving Wash Arms and the patented Dual-Drive Conveyor.



GUARANTEE AND SERVICE

All Hobart machines are guaranteed and serviced by *one* nation-wide organization. This simplifies the maintenance as well as the purchase of all machines used in your kitchen.

Illustrations show representative models only—there are others in each line to meet the most varied demands. For details and specifications on these or any other models, consult your Hobart representative or write the factory.

THE JACKSON DISHWASHER COMPANY
3703 East 93rd Street Cleveland 5, Ohio
Dishwashing Specialists Since 1925

SCHOOLS PRAISE JACKSON DISHWASHERS

YOU also may increase the operating efficiency of your school kitchen and maintain the highest standards of sanitation by using the Jackson Dishwasher. Read this glowing tribute to the efficiency of the Jackson Dishwasher from Mrs. J. H. Hummel, manager of the Wilson School Cafeteria, the Wilson School, Phoenix, Arizona:

"I am glad to endorse the Jackson Dishwasher. The Wilson School is one of the largest schools in the state. We serve an average of around 1300 people per day and use the grill plate, yet two women now do all the dishwashing which formerly required the services of sixteen girls."

- **FOR CLEAN SANITARY DISHES**
- **EASY TO INSTALL**
- **ECONOMICAL**
- **EFFICIENT**
- **HIGH SPEED**
- **FOOL PROOF**
- **SPACE SAVING**
- **LEGS ADJUSTABLE FOR VARIABLE HEIGHTS**



MODEL NO. 1-A

THE MODEL NO. 1-A JACKSON DISHWASHER is adaptable for multiple installations or as an auxiliary unit. The No. 1-A has ample capacity to wash, rinse, and sanitize all your dishes, glasses and silverware. Its revolving hood and pivot support eliminates any lifting when counter-sunk.



MODEL NO. 2

THE MODEL NO. 2 JACKSON DISHWASHER is a large machine for high speed heavy duty assignments. Its counter-balanced hood provides ample clearance for sliding baskets through from either side or from corner installations. The No. 2 is easy to install, and the legs are adjustable to any size or height table.

WRITE FOR COMPLETE INFORMATION ON ALL JACKSON MODELS. PLACE YOUR ORDER NOW FOR DELIVERY SOON!

UNIVERSAL WASHING MACHINERY CO.

Nutley 10, New Jersey



YES, SIR! A happier kitchen can be secured by having a new Universal Dish Washing Machine installed. Various sizes of these machines will wash from 2,500 to 30,000 pieces (1,250 to 15,000 dishes) per hour. Operation is either automatic or semi-automatic depending on which type of machine fits your needs. They are all welded steel construction and all models can be obtained in heavy galvanized steel or stainless steel. Tanks are excellently welded on the outside and solder is heavily flowed on the inside, giving tanks unusually long life. Supporting legs on all models are made of heavy, hot rolled steel, electric welded to dishwasher, and have adjustable feet.



MODEL U—One tank, push through (curtains). Floor space 28 x 34½. 4,000 pieces or 2,000 dishes per hour. Motor ¾ h.p. Wash tank capacity 25 gal.; pump capacity 140 gal. Five 20 x 20 racks.

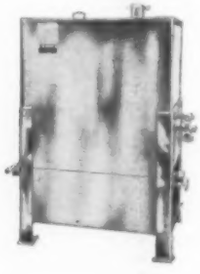
MODEL M — One tank, straight through (doors). Floor space 28 x 30. 4,000 pieces or 2,000 dishes per hour. Motor ¾ h.p. Wash tank capacity 25 gal.; pump capacity 140 gal. Five 20 x 20 racks.



MODEL T2 — Two tanks, immersion. Floor space 20½ x 48½. 4,000 pieces or 2,000 dishes per hour. Motor ¼ h.p. Wash tank capacity 20 gal.; rinse tank capacity 20 gal.; pump capacity 300 gal. Four 14 x 18 racks.



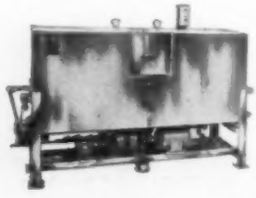
MODEL T3—Three tanks, immersion. Floor Space 20½ x 66¼. 5,000 pieces or 2,500 dishes per hour. Motor ⅓ h.p. Wash tank capacity 20 gal.; rinse tank capacity total 40 gal.; pump capacity 350 gal. Four 14 x 18 racks.



MODEL H—One tank, push through (curtains). Floor space 26 x 28½. Capacity 2,500 pieces or 1,250 dishes per hour. Motor ½ h.p. Wash tank capacity 15 gal.; pump capacity 100 gal. Four 18 x 18 racks.



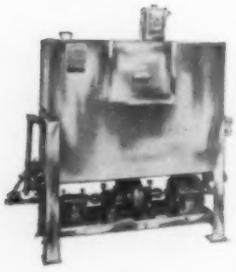
MODEL HD — One tank, straight through (doors). Floor space 26 x 24. 2,500 pieces or 1,250 dishes per hour. Motor ½ h.p. Wash tank capacity 15 gal.; pump capacity 100 gal. Four 18 x 18 racks.



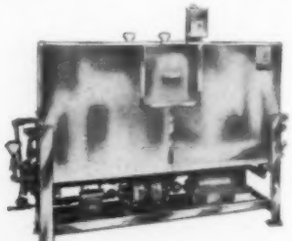
MODEL N — Two tanks, Pawl conveyor (curtains). Floor space 28 x 82½. 15,000 pieces or 7,500 dishes per hour. Motor 3 h.p. Wash tank capacity 35 gal. rinse tank capacity 35 gal.; pump capacity 450 gal. Fifteen 20 x 20 racks.



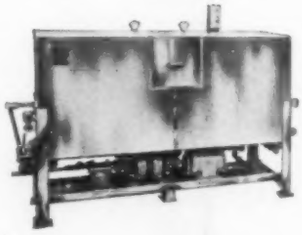
MODEL E — One tank, corner type (doors). Floor space 28½ x 29½. 4,000 pieces or 2,000 dishes per hour. Motor ¾ h.p. Wash tank capacity 25 gal.; pump capacity 140 gal. Five 20 x 20 racks.



MODEL Y — One tank, pawl conveyor (curtains). Floor space 28 x 46½. 6,000 pieces or 3,000 dishes per hour. Motor 1 h.p. Wash tank capacity 38 gal.; pump capacity 180 gal. Seven 20 x 20 racks.



MODEL MM—Two tanks, pawl conveyor (curtains). Floor space 28 x 70½. 10,000 pieces or 5,000 dishes per hour. Motor 2 h.p. Wash tank capacity 27 gal.; rinse tank capacity 27 gal.; pump capacity 360 gal. Ten 20 x 20 racks.



MODEL A — Two tanks, pawl conveyor (curtains). Floor space 28 x 94½. 20,000 pieces or 10,000 dishes per hour. Motor 5 h.p. Wash tank capacity 40 gal.; rinse tank capacity 40 gal.; pump capacity 550 gal. Fifteen 20 x 20 racks.

For Additional Models, send for Complete Catalog and Price List

UNIVERSAL WASHING MACHINERY COMPANY, NUTLEY, N. J.

JOHN E. SMITH'S SONS CO.

50 Broadway, Buffalo 3, New York

SALES AND SERVICE OFFICES IN PRINCIPAL CITIES

SAVE TIME
AVOID WASTE and REDUCE EXPENSE

in your Kitchen with

Buffalo

KITCHEN MACHINES

Mechanical units in school and university kitchens must be economical in both initial and maintenance costs and should render many years of efficient service. They must save time, reduce food waste, meet stringent sanitary requirements and prove a definite help in the preparation of healthful and attractive menus.

The Buffalo products shown here are designed to meet... and have met... every condition of economy and utility required by the most rigid school and university specifications.

There are other Buffalo labor-saving machines that meet many modern kitchen needs. They are described in our Catalog. Write for a free copy today.

Attachments for BUFFALO Vegetable Slicers and BUFFALO Food Cutters

Grater—grating cheese, bread crumbs, nuts.
Shredder 5/64" holes—shreds vegetables, etc.
French Fry Cutter.
Julienne Potato Cutter.
Adjustable Slicer—vegetables, nuts, fruits.
Shredder 3/16" holes.
Vegetable Slicer housing furnished as standard equipment including adjustable slicer No. 4.
Meat Chopper No. 12, 200 lb. per hour; No. 22, 400 lb. per hour.
Vegetable Slicer door for slicing vegetables at right angles to knife.
Hub Adaptor—required to connect attachments to Food Cutter.
Knife and Tool Grinder.
Orange Juice Extractor.



BUFFALO Self-Emptying Meat and Vegetable Cutter Model 120

OTHER MODELS

NO.	BOWL SIZE	CAPACITY
321	21 in.	20-25 lbs.
217-D	17 in.**	15 lbs.
111-D*	15 in.**	10-12 lbs.
114*	14 in.**	7 lbs.

*Also made in bench type without pedestal. **Bowl is removable.

The machine of 100 uses in the kitchen. The only self-emptying model made. For fine chopping of all kinds of meats and vegetables. Its 20" non-removable bowl holds 20 lbs. of fresh meat. Eliminates hands contacting foods. Safe and sanitary.



BUFFALO Bread Slicer (Model 1-A)

OTHER MODELS

NO.	MAXIMUM LOAF SIZE
1½	5¼" x 5" x 23"
2-A	7" square x 26" long

All models either power or hand driven.

Saves time by eliminating hand-slicing. Cuts more slices per loaf, all uniform. Saves from 4 to 6 slices per loaf. Automatically fed, sliced and stacked. Thickness of slice adjustable from ⅛" to ⅞". Model 1-A maximum loaf size 4¼" x 5¼" x 22".

Buffalo

JOHN E. SMITH'S SONS CO. SAUSAGE MACHINERY

QUALITY KITCHEN MACHINES

THE AMERICAN SCHOOL AND UNIVERSITY—1946

THE FORMICA INSULATION CO.

4614 Spring Grove Avenue, Cincinnati, Ohio

Plastic RESTAURANT AND LIBRARY TABLE TOPS AND DESKS TOPS!

FORMICA provides a plastic finish for many surfaces about the school. It is very desirable because it is sanitary and easy to keep clean; it is very resistant to spotting, staining, cracking or deterioration by ordinary use. There are many handsome colors and finishes.

FORMICA RESTAURANT TOPS

In school restaurants, as in the overwhelming majority of other restaurants, Formica table tops are most widely used. They do not spot with ordinary liquids, do not chip or crack; they are sanitary and easily kept clean. They last for years without maintenance attention.

LIBRARY TABLE TOPS

In libraries and reading rooms Formica tops are finding wide application. They were used in the Annex to the Library of Congress for this purpose and have been installed in many schools and universities. "Realwood" Formica consisting of veneers of genuine wood cured into the plastic sheet—and obtaining thereby all the characteristics of a plastic—are available for this purpose.

SCHOOL ROOM DESK TOPS

No other finish can provide more attractive tops for study desks than Formica. It resists many forms of abuse that ruin the appearance of ordinary desks. It is easy to clean; stable in color; non-absorbent, not easily cracked or broken.

Formica is used for lobby wall paneling, for counter and table tops, desk tops in business offices and for many other similar uses. Literature with color suggestions and a complete discussion of the characteristics of the material is available on request.



● Formica table tops in a linen finish installed in a vocational school by the Chicago Board of Education.



● Formica table tops in a study room of the Crowe Island School, Winnetka, Ill. Specified by Eliel and Eero Saarinen.



● Desk tops of Formica (linen finish) in a room of the Crowe Island School, Winnetka.

FORMICA

FOR FURNITURE FIXTURES AND BUILDING PURPOSES

LOWERATOR DIVISION

American Machine & Foundry Co.

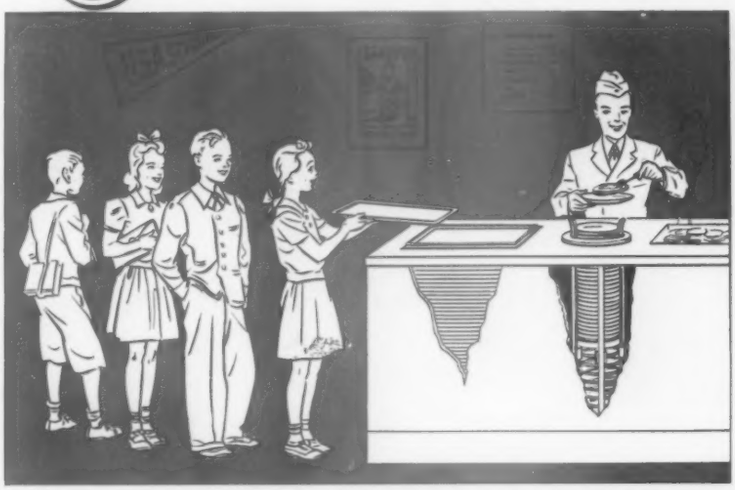
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SERVE MORE STUDENTS MORE QUICKLY WITH...

LOWERATOR DISPENSER

REG. U.S. PAT. OFF.

AUTOMATIC STORAGE AND DISPENSING UNITS FOR CHINA, GLASSES, TRAYS



Typical AMF Lowerator school cafeteria installation showing tray and plate dispensers. Dangerous stacks of loosely-piled trays are eliminated. AMF Lowerators store and protect from 150 to 200 trays. Safe...convenient for children! Seventy-two plates, stored in the under-counter space, are protected from chipping, breakage, or personal contact. Service is not interrupted; replacements are lowered into the dispenser from top. Units need not be empty.

PROFIT-MAKING FEATURES

- **SAVES SPACE** Puts *vertical*, under-counter space to use... no more scattered piles of dishes.
- **SPEEDS SERVICE** No bending, stooping, searching...every dish is where its wanted, when it's wanted...at convenient counter-level.
- **COMBINES STORAGE WITH DISPENSING** Each piece of china stored in unit is automatically ready for convenient counter-level dispensing.
- **REDUCES BREAKAGE** No loose open stacks of china to invite chipping or breakage. Reduces handling...protects china and glassware from personal contact.
- **EASILY INSTALLED** No need to change floor layouts. Installation is quick, simple.

THERE ARE 2 GENERAL TYPES

COUNTER TYPE is a complete operating unit for built-in counter installations. Plate and dish dispensers are cylindrical. Capacity—*from five to seven dozen.* China, glass, or tray dispensers are furnished in chassis form, consisting of the complete operating unit, assembled in a rectangular steel frame which may be fitted into a counter or fixture. Capacity—*from seven to fifteen dozen.*

FLOOR TYPE is a complete unit, ready to set up for operation. Finished outside covering in stainless steel, Duco, or other harmonizing material. Cabinets are mounted on chrome plated, adjustable ball feet or with casters.

HEATED MODELS for plate or cup warming may be had in both of the above types. Operating cost is low!

HIGHLY RECOMMENDED

The AMF Lowerator System is enthusiastically endorsed by leading Kitchen Equipment Dealers, Engineers, Consultants and Architects. See it on display at Architects Sample Bureau, 101 Park Avenue, New York City, near Grand Central Terminal.

SIMPLE TO OPERATE

Because of the "Fool Proof" design, no training is needed to operate a Lowerator. The calibrated spring action does the work automatically.

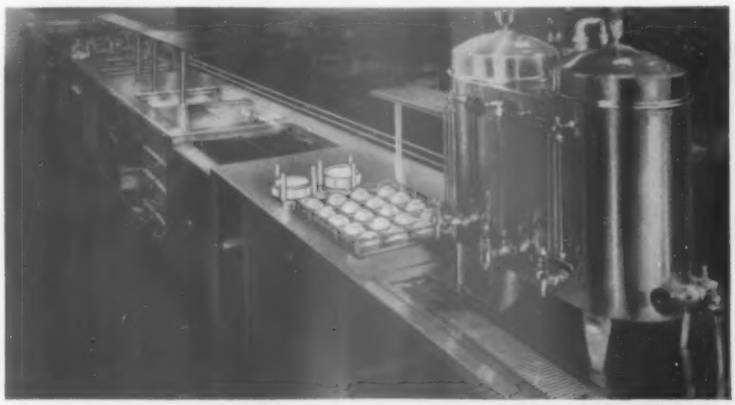
NO SERVICING...NO MAINTENANCE

Because the calibrated spring is the only operating mechanism, there is no need for servicing, repair, or maintenance! Every AMF Lowerator Dispenser is built to meet exacting standards in performance, materials, and craftsmanship.

CONSULT YOUR KITCHEN EQUIPMENT DEALER OR WRITE DEPT. TA-103

LOWERATOR DIVISION

AMERICAN MACHINE & FOUNDRY CO., N.Y.



COURTESY OF S. BLICKMAN, INC.

AMF Lowerators at Syracuse University Cafeteria, N.Y. In the background are cup and saucer dispensers. At the beginning of the counter are bowl, bread and butter and dessert dish dispensers...within easy reach of the attendant...always at counter level!



AMF Lowerator installation at International House, Columbia University, N.Y. In the foreground are ice cream dish and saucer dispensers. Note cup and saucer dispensers at coffee station.



Student smilingly removes tray from AMF Lowerator Dispenser. Trays, conveniently stored in the under-counter space so often wasted, rise to counter level. In the lower corner is a dish dispenser for salads.

KEYES FIBRE COMPANY

Manufacturers of Keyes Molded Products
420 Lexington Avenue, New York 17, N. Y.
PLANT AT WATERVILLE, ME.

KYS-ITE

Trademark Reg. U. S. Pat. Off.

FIBROUS PLASTIC

SERVING TRAYS AND PLATES



Strong yet Light—
Pile on dishes high and heavy . . . KYS-ITE can take it. Impact strength up to *5* times that of ordinary plastics . . . and so light in weight that even small children can handle their loaded KYS-ITE trays easily.



Impervious to Boiling
—We've boiled KYS-ITE trays and plates for *14 days* in soap and other solutions with no ill effects . . . a KYS-ITE feature that makes this tray a favorite in schools and colleges (hospitals, too) where highest standards of cleanliness are maintained.



Good Looking
—Meals look more appetizing on attractive trays. KYS-ITE trays *stay* lustrous . . . glossy finish is part of the material itself, thus *absolutely permanent*. A wipe and it's bright.

KEYES
MOLDED PRODUCTS

3 Partition Divided Plate





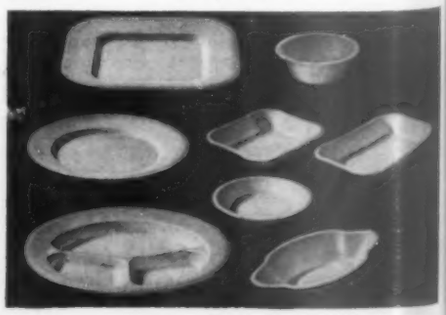
Rectangular Tray

These are the trays and partitioned food serving plates designed to meet your most rigid specifications . . . made of KYS-ITE, the amazing fibrous plastic with a combination of seldom-found-together features *unequalled by any other type of material*. These are rugged trays built to carry heavy loads of dishes, but light enough for easy handling; easy-to-clean trays and plates second to none in appearance, but with a durability that *keeps* them beautiful even when subjected to grease or alcohol, mild acids or boiling solutions. In short, these are *special* trays and plates to meet *special* requirements for school and college dining rooms.

At your regular wholesaler or supply house . . . or write for name of your nearest distributor. Available in the following shapes and sizes:

Number	Size	Shipping Weight
	Rectangular Trays	
113	13⅞ x 10¼	14 lbs. per doz.
112	16½ x 12¼	21 lbs. per doz.
111	18 x 14	28 lbs. per doz.
114	20¾ x 15⅜	36 lbs. per doz.
116	6½ x 4½	13 lbs. per carton of 6 doz.
	Round Trays	
131	11" (Dia.)	9 lbs. per doz.
	Round 3 Partition Divided Plates	
231	11" (Dia.)	7 lbs. per doz.

Use-and-throw-away Tableware—Molded from spruce pulp, good-looking CHI-NET dishes cost so little they can be used once and then discarded. Amazingly rigid with a smooth hard surface that resists moist and greasy foods . . . coming into institutional uses more and more.



S. BLICKMAN, INC.

Manufacturers of Food Service Equipment for Schools and Institutions

3400 Gregory Ave.
WEEHAWKEN, N. J.



A Typical Blickman Cafeteria Installation

A 3-Way Service FOR MASS FEEDING INSTALLATIONS

1 ENGINEERING and LAYOUT: Our experts are trained to evaluate the specific requirements of a particular establishment and to arrange space and equipment for most efficient operation. On approved contracts, our service includes related planning, manufacture and installation of complete units — from the small pantry or service counter to the large kitchen serving thousands of individuals.

2 DESIGN and FABRICATION of INDIVIDUAL UNITS: BLICKMAN engineers carefully design each item to carry out its function efficiently. Our units are noted for their welded round-corner construction — providing sanitary, crevice-free surfaces. They are easy to clean, durable and attractive in appearance.

3 THE "KNOW-HOW" IN BUILDING FINE FOOD SERVICE EQUIPMENT: For over 50 years, S. BLICKMAN, INC. has specialized in the planning and manufacture of food service installations for every need. Our factory is one of the largest of its kind. Experienced mechanics work with modern tools to give you the finest in food service equipment.

INDIVIDUAL ITEMS OF FOOD PREPARATION AND FOOD SERVICE UNITS Include:

- Automatic Electric Hot Food Storage Tables
- Bain Maries
- Cabinets
- Cafeteria Counters
- Cereal Cookers
- Coffee Urns
- Cooks Tables
- Dish Heaters
- Dish Tables
- Dish Trucks
- Dish Warmers
- Food Conveyors
- Food Trucks
- Kitchen Cabinets
- Pan and Pot Racks
- Pantry Cabinets and Cupboards
- Plate Warmers
- Preparation Tables
- Range Hoods
- Service Units
- Sinks
- Steam Tables
- Storage Bins and Closets
- Tray Trucks
- Utility Trucks
- Urn Stands
- Warmers
- Water Coolers
- Work Tables

Special equipment built to specifications • Orders subject to Government priority regulations



Send for this folder on Food Service Equipment

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Columbia University, New York
Syracuse University, Syracuse
Hershey (Pa.) Industrial High School
Bayonne (N. J.) Senior High School
Suffern (N. Y.) Grade School
Washington, D. C. — 15 schools
U. S. Government: Numerous installations for the armed forces.



STEAM TABLES



BAKERS' TABLES



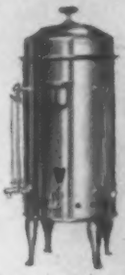
WORK TABLES



SINKS



DISH TRUCKS



COFFEE URNS

FROM A SINGLE UNIT TO A COMPLETE INSTALLATION

THERMOLATOR
EQUIPMENT
HOT FOOD STORAGE AND SERVING TABLES
Automatically Controlled COFFEE MAKERS

ERSHLER & KRUKIN, INC.

BAYONNE, NEW JERSEY

Manufacturers of Equipment for the Economical Preparation and Service of Foods and Beverages



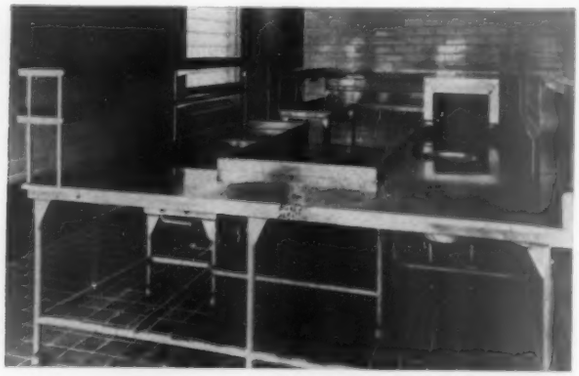
TO SOLVE TOMORROW'S FEEDING PROBLEM PLAN TODAY... WE CAN HELP YOU!



Modern stainless steel counter recently installed in Horace Mann High School, New York City. Note cutlery and tray dispensing units, salad refrigeration, dish dispensers, steam table unit, dessert refrigeration and ice-cream dispenser.

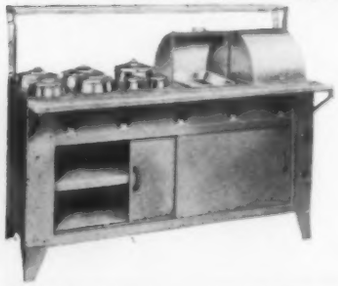


TYPICAL MAIN KITCHEN



TYPICAL DISHWASHING ROOM

WHETHER your problem is a complete new installation or modernizing and expanding existing facilities, our experienced organization can serve you by designing, building and installing equipment made to your requirements. Please consult us, especially in the early stages of your planning.



HOT FOOD TABLE—GAS OR ELECTRIC

COFFEE MAKER



SINKS



SOILED DISH TRUCKS

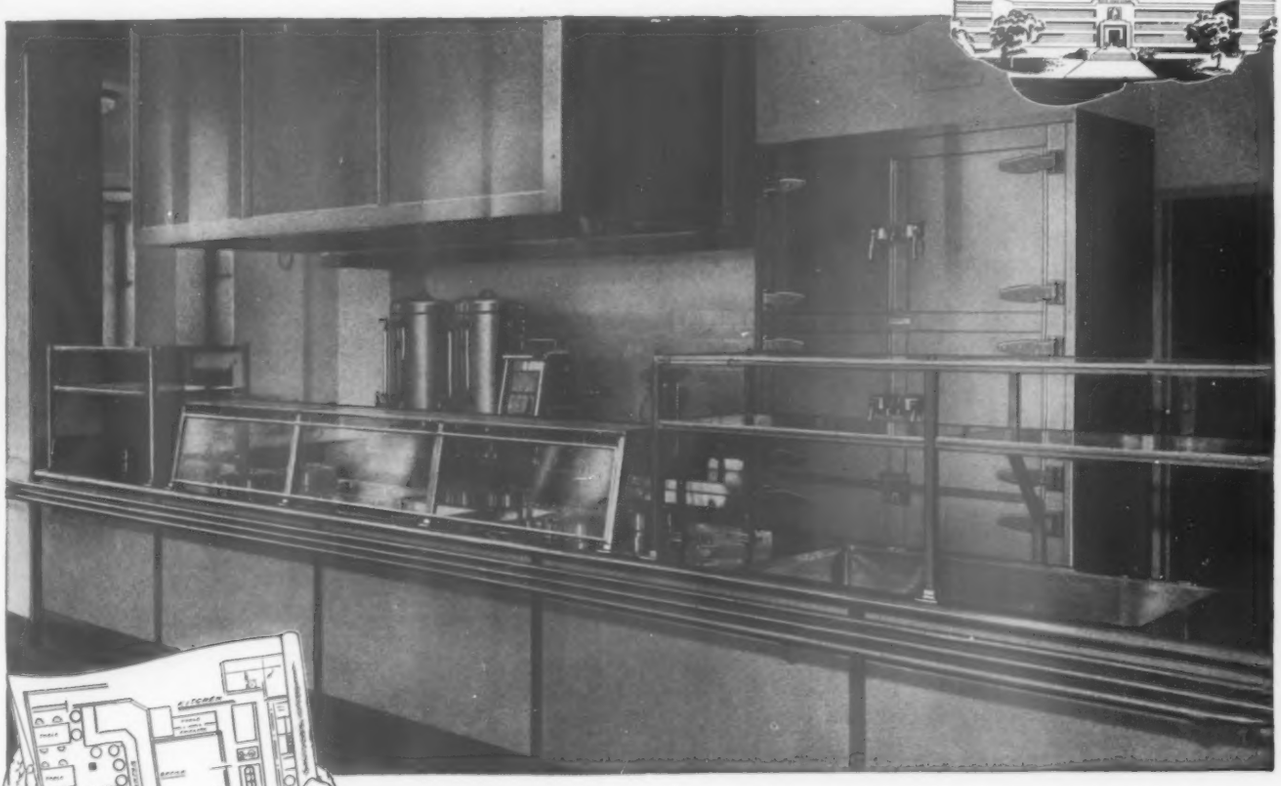
NATHAN STRAUS-DUPARQUET, INC.

Sixth Ave., 18th-19th Sts., New York 11, N. Y.

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FOR THE SCHOOL OF TOMORROW . . .





LET'S PLAN TODAY!

War lessons are the basis of today's planning! We too were busy learning these past four years . . . gaining experience working for Uncle Sam — helping to convert a large number of America's schools, colleges, and universities into training centers for our Armed Forces.

Our Food Service Engineers have acquired invaluable experience in kitchen and cafeteria design . . . our Decorators and Buyers, busy renovating and equipping class rooms, dormitories and social rooms, have obtained a fuller understanding of school designing problems.

The Nathan Straus-Duparquet Organization today stands ready to give you the full benefit of its "war learned" experience assisting you in planning your School of Tomorrow!

NATHAN STRAUS · DUPARQUET

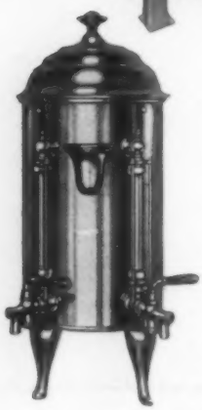
FURNITURE AND FURNISHINGS · DUPARQUET KITCHEN EQUIPMENT
REFRIGERATION · CHINA · GLASS · SILVERWARE · UTENSILS

THE AMERICAN SCHOOL AND UNIVERSITY—1946

THE JOHN VAN RANGE CO.

525–555 Culvert Street, Cincinnati, Ohio





COMPARTMENT STEAMERS
STEAM TABLES
FOOD WARMERS
COFFEE URNS
SINKS...TABLES
LUNCH ROOM AND CAFETERIA EQUIPMENT





99 Years of Leadership in

FOOD SERVICE EQUIPMENT FOR SCHOOLS AND COLLEGES

EVER since its establishment in 1847 The John Van Range Company has specialized in designing and manufacturing food service equipment for public and private schools and colleges. The first portable steel range in the world was the invention of the founder of this company. His successors have pioneered in developing new and improved equipment consistent with the advance in the science of mass feeding.

Thousands of establishments for which we have planned the food service departments and manufactured the equipment testify to the resulting economies of maintenance and operation.

THOSE LISTED BELOW ARE FAIRLY REPRESENTATIVE

Purdue University ..... Lafayette, Ind.
Hanover College ..... Hanover, Ind.
St. Joseph College .... Rensselaer, Ind.
Holmes High School .... Covington, Ky.
Ft. Thomas High School Ft. Thomas, Ky.
University of Kentucky .. Lexington, Ky.
Boston Public Schools .... Boston, Mass.
Holy Cross College ... Worcester, Mass.
North Carolina State College Raleigh, N. C.
University of Cincinnati Cincinnati, Ohio
Hebrew Union College Cincinnati, Ohio
Withrow High School .. Cincinnati, Ohio
Woodward High School Cincinnati, Ohio
Xavier University ..... Cincinnati, Ohio
Ohio State University .. Columbus, Ohio
Hiram College ..... Hiram, Ohio
Miami University ..... Oxford, Ohio
Providence College ... Providence, R. I.
University of South Carolina Columbia, S. C.
University of Tennessee Knoxville, Tenn.
University of West Virginia Morgantown, W. Va.
Marshall College .. Huntington, W. Va.

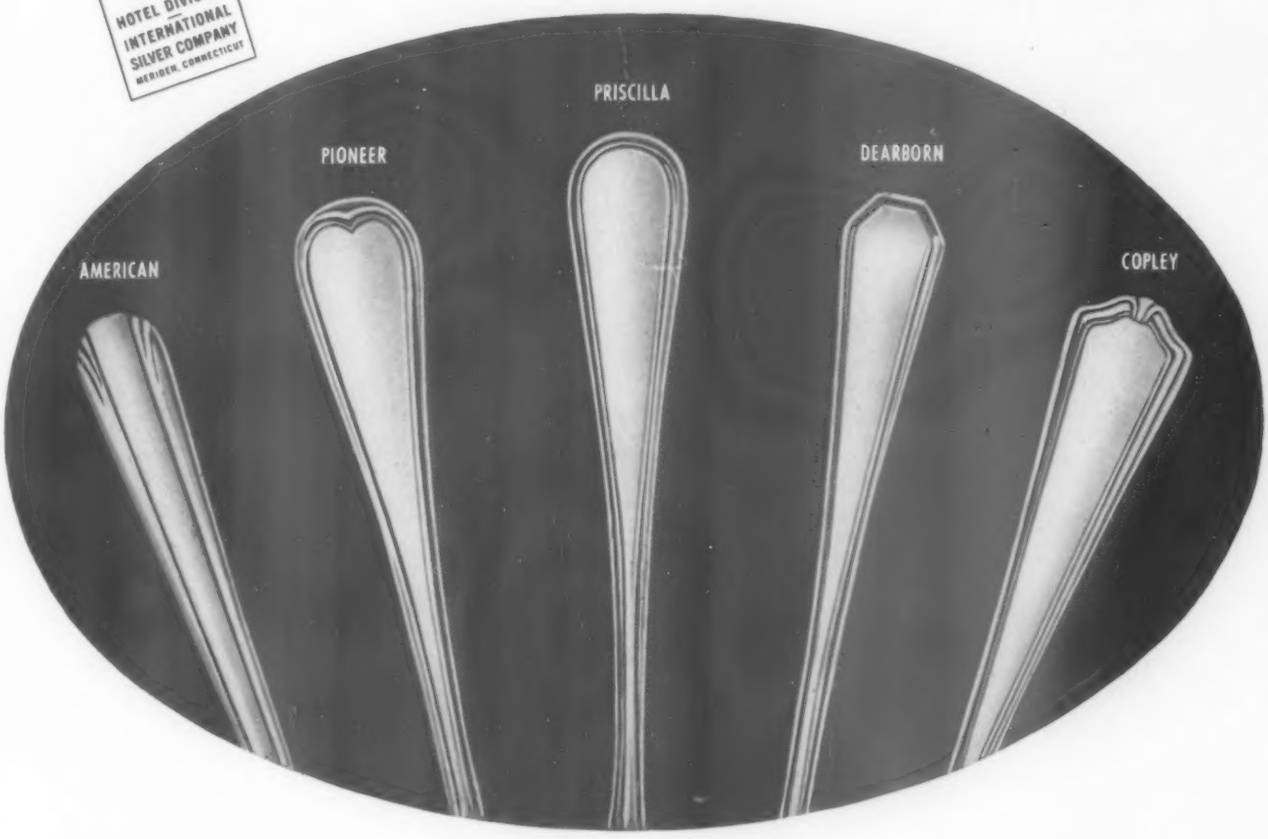
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Cincinnati

BRANCHES IN PRINCIPAL CITIES

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SILVER COMPANY
MERIDEN, CONNECTICUT

INTERNATIONAL SILVER COMPANY



A *Finer* SILVERPLATE WITH *Finer* FINISH AND *Finer* QUALITY

RECOMMENDED FOR SCHOOLS AND COLLEGES

International S. Co. XII Triple combines fine table appearance with long service...

because handsome patterns are *triple-plated* on heavy weight, prewar quality basemetal . . .

because new automatic plating assures h-a-r-d surfaces and uniform deposit . . .

because two invisible reinforcing overlays of pure silver on backs of bowls, tines and tips of staple pieces give protection where wear is hardest . . .

because hollow handle knives and new stainless solid handle knives are available in all patterns . . .

because patterns have a *Bright Butler Finish* which will add richness to your table . . .

Outstanding new improvements feature the following: Hotel size or Utility forks with practically unbendable tines . . . Cream Soup or Hotel Size Bouillon Spoons, Knives with comfortable, perfectly balanced "taper ground" blades.

Give your food service equipment or supply dealer a call today if your order has not been placed.

QUALITY SILVERWARE for

SCHOOL CAFETERIAS • COLLEGE DINING HALLS • CLUBS

DOEHLER METAL FURNITURE CO., INC.

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SALES OFFICES: Washington, D. C. · Los Angeles · San Francisco · Portland, Ore.
FACTORY: Plainfield, Connecticut



DOEHLER WOOD FURNITURE

The Dormitory Desk illustrated is but one of many Wood Furniture items by Doehler for classroom, living and recreational requirements. Doehler beds, bunks, desks and chiffodesks, chiffoniers, dressers, dresserobes, chests, tables and chairs may be had in the traditional period or popular contemporary styles.

Leading schools and universities specify Doehler Furniture, and rely on Doehler's advisory and planning service, which is backed up by extensive experience in the school field, and characterized by the combination of attractive, comfortable, serviceable pieces and a price range well within school and university budgets.





DOEHLER METAL FURNITURE

Experience has shown that all types of Doehler Metal Furniture have proved widely adaptable for school and college use. Now, with restrictions removed, a new and sensationally beautiful chrome-plated line has been added. It lends itself admirably to the furnishing of reception, waiting and recreation rooms, libraries, cafeterias and offices. The quality of the chrome plating, due to our war production experience, exceeds even our fine pre-war quality. The fabrics, in solid or contrasting colors, are the finest procurable. The finishes are the best the market affords—all in true adherence to rigid Doehler strength-and-quality standards.

Write for prices and literature on Doehler's wide range of settees, easy chairs, side chairs, desks, tables, costumers and lamps.

ONE OF MANY ITEMS, ESPECIALLY SUITABLE FOR DORMITORY AND CAFETERIA USE:

No. 520 Side Chair, Metal Frame, Upholstered Seat, Upholstered Back.*

Overall Height	29¼"
Overall Depth	19½"
Overall Width	16½"
Seat Height	18 "
Seat Width	14½"
Seat Depth	15½"
Back Height	9 "
Back Width	15 "

Shipping Weight (2 to carton)—30 lbs.

Frame: Standard Finish—Brown Enamel, other colors furnished on request.

Upholstering: DuPont Fabrikoid.

* Also available in all metal (No. 500); and in metal frame with Upholstered Seat (No. 510).



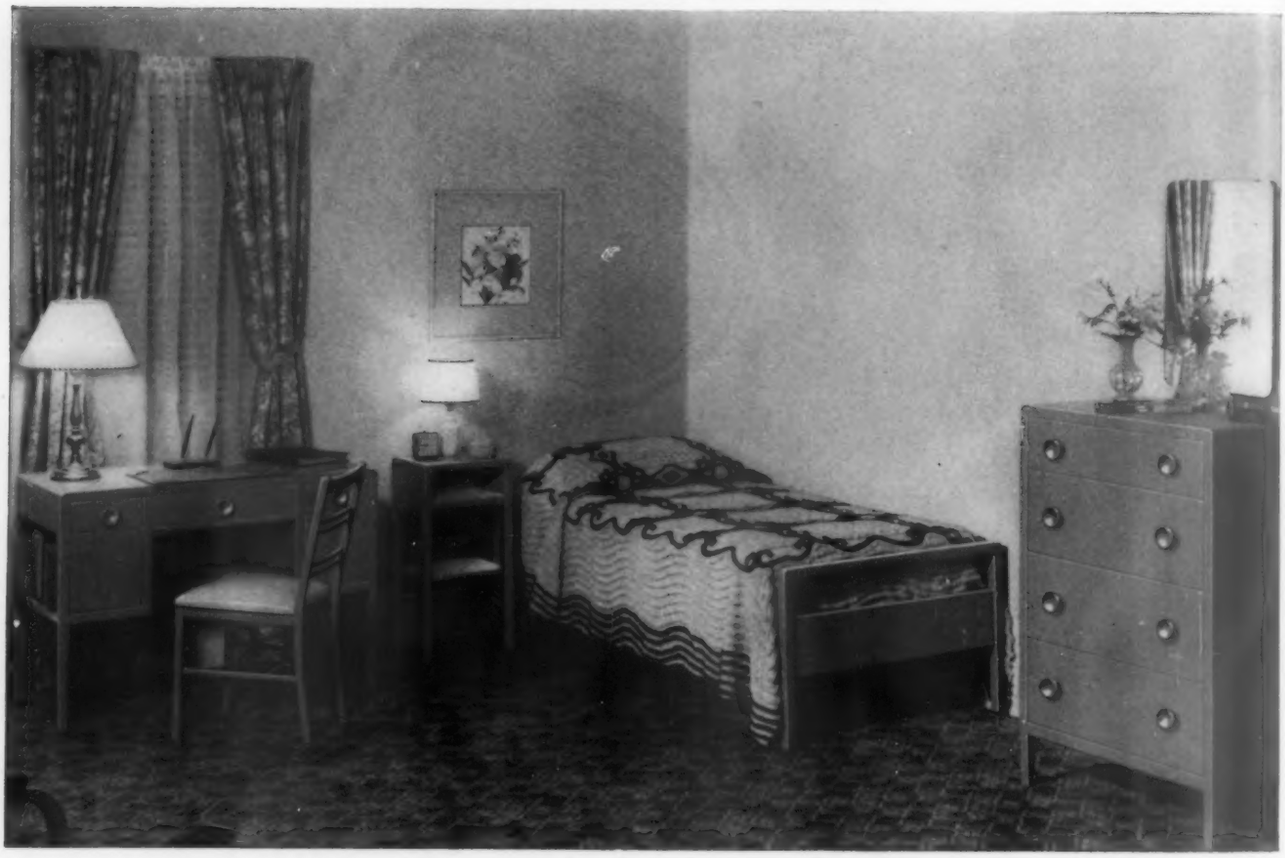
Doehler

Institutional Division

SIMMONS COMPANY

DORMITORY DIVISION

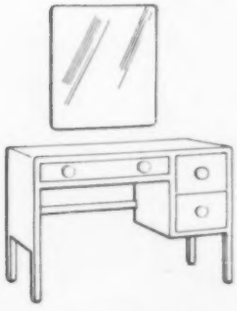
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SIMMONS METAL FURNITURE

. . . Brings You Everlasting Beauty



SIMMONS *vanity dresser and mirror . . . one of the many additional items from the pieces available in this grouping.*

Here is *built-in* beauty—functional beauty—designed in metal to last a long, long time! No wonder America's leading dormitories and schools choose Simmons Metal Furniture and Sleep Equipment.

Our more than 70 years' experience is reflected in the new Simmons metal furniture. For here is *real quality* . . . with a performance record to match its practical good looks.

Full information is *yours* for the asking. See your Simmons dealer or write direct to any Simmons office.



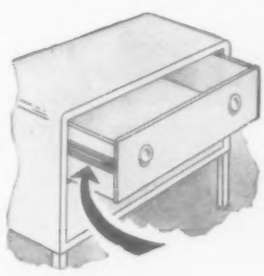
DURABLE *Simmons Metal Furniture can take the hard knocks. It retains its good looks and serviceability after years of hard use.*



LASTING FINISH *Simmons' exclusive "Simfast" finish resists weather . . . is impervious to most liquids. It will not chip, mar, warp, peel or crack.*



ONE-PIECE CONSTRUCTION—*Top and sides are one piece. Supports and braces electrically welded. This means greater strength and durability.*



EASY-ACTION DRAWERS—*Simmons' wood drawer guides assure smooth, quiet drawer operation. No tugging and straining to open drawers.*



SAFETY DRAWER STOPS—*Spring clip, rubber-cushioned drawer stops prevent drawer from falling out when opened. Easily released for cleaning.*

School boards and dormitory managers everywhere are finding it profitable to standardize on Simmons METAL Furniture. For this handsome, functional furniture assures years of outstanding service—at low cost. Find out how *you* can benefit, too! See your established Simmons dealer or write direct to any Simmons office.

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Contract Department, 2219 South Halsted Street, Chicago 8, Ill.



CT 1717 COMBINATION TWIN AND BUNK BEDS

Practical bunk arrangement for limited space, easily converted into twin beds. Beds are of all metal construction with full waterfall steel panel, graceline posts. Coil springs, helical tied, with side rail attached. No mattresses currently available. Overall height, bunk arrangement, 69 in.; from floor to top of top spring, 52 in.; space between springs, 29 in.; width, 39 in. Strong steel construction, welded ladder.







METAL BED No. CT 658-LE—Attractively designed in simple, graceful lines. This bed is sturdily constructed to give years of satisfactory service. Made from molded tubing, shaped fillers and cross rods. 2 in. casters. Finished in baked-on enamel. Height (including casters), 26 in. Height of fabric, 17 in. Sizes, 3-0 and 3-3.

METAL BED No. CT 653-LE-B—Designed similar to the CT 658 bed, except head end is higher and panel in head and foot replaces two of the fillers. Continuous posts, fillers and cross bars of molded tubing. Height of head (including casters), 36 in. Height of foot (including casters), 26 in. Height of fabric, 18 in. Size 3-0.



CHEST No. CT 4401—For greater drawer space, the CT 4401 chest is available in the same graceful design as the dresser. May be used as matching piece for dresser, or individually. Also available with mirror for individual use. Height, 50 in. Top, 19 in. x 32 in.

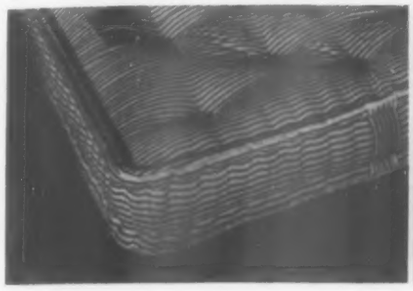
DRESSER No. CT 4401—The functional design and simplicity of the No. CT 4401 Dresser makes it extremely practical for school dormitories and university residences. Sturdily constructed of steel . . . will give years of durable service. Available in beautiful wood-grain finishes. Height, overall, 66½ in. Height of base only, 38½ in. Top, 19 in. x 40 in. Mirror, 23¾ in. x 27½ in.



TO LIVE RIGHT... *Sleeprite*

SUPERIOR SLEEPRITE CORPORATION

Contract Department, 2219 South Halsted Street, Chicago 8, Ill.







CT REST EASE MATTRESS (*above left*)—All white layer-cotton-felt, covered with 6 1/5 oz. Government-standard ticking (blue and white woven stripe); heavy and serviceable. Roll edges reinforced with white tape. Matched taped strap handles for easy, frequent turning that promotes long, satisfactory wear.

CT REST HAVEN MATTRESS (*above center*)—White felt, including 25% STAPLE COTTON; built in twin inner units, joined—to hold shape permanently—by center pad of strong, resilient stitched sisal. Features Pre-Built border with multiple embroidered ventilators. White taped-edge reinforcement. Firm, smooth sidewalls assured by 2 rows of concealed side-stitch. 8-oz. ACA cover, button tufted. Matching taped strap handles.

CT REST AIR MATTRESS (*above right*)—Hair content, has double padding of stitched curled hair interlaced on muslin. Cushioned on all-white layer-cotton-felt center. A deluxe, springy construction—for years of splendid service and greatest comfort. Roll edges with fancy taped seams, and with sidewalls kept lastingly trim and strong by 2 rows of hand side-stitching. Heavy, attractive 8-oz. woven stripe cover, extra-button-tufted in biscuit pattern. Matching taped handles.



DOUBLE STUDY DESK No. CT 4727—A practical study desk for maximum utility. Center drawers open from both sides. Durable construction resists abuse. Metal top assures smooth, attractive, working surface at all times. Height, 31 in. Top, 30 in. x 48 in.

CHAIR No. CT 4303—Neat, attractive appearance in a durable, well-built chair. Made of square steel tubing with flat tube fillers. The double H leg reinforcement makes construction sturdy. Glides. Height, overall, 35 in. Seat, front, 16½ in.; depth, 15½ in.



DRESSER WITH MIRROR No. CT 1861—The modern design of this attractive but practical dresser, with its attached mirror, makes it an extremely desirable piece for school dormitories and university residences. Available in all metal, two tone enamel finish in pastel brown with creme. Depth, 19 in., width, 41 in., height, 36 in., height to top of mirror, 71¼ in. The plate glass mirror is 30 in. x 32 in.
No. CT 1860—same in Wheatwood Plate-Grain finish.





CHEST No. CT 1861—As a companion piece to the dresser at the right, or for use separately, this modern style all metal constructed chest is well adapted for serviceability and at the same time adds modern beauty to dormitory or residence. Depth, 19 in., width, 34 in., height, 46 in.
No. CT 1860—same in Wheatwood Plate-Grain finish.



TO LIVE RIGHT... Sleeprite

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Furniture for Schools, Colleges and Libraries

General Offices and Plant: Batesville, Indiana



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Natural quarried stone of medium hardness, blue-gray in color, produced and fabricated for more than 50 years; used in increasing quantities for:

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Selected stone of extreme hardness, reserved exclusively for Stair Treads, Landings, Platforms, and Flooring. Tests show an abrasive hardness factor of 25-40, the highest durability factor on the National Bureau of Standards scale of any natural stone commercially used for these purposes. Its siliceous nature makes it non-slip wet or dry.

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Variety of extremely hard stone, especially selected for laboratory working surfaces. Takes a permanent high sheen when rubbed down with oil. Abrasive hardness factor, 25-40, National Bureau of Standards tests.

ALBERENE BLACK SERPENTINE

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Alberene laboratory fixtures are practically one piece structures of solid stone. Table top slabs are united by a practically invisible joint employing a strip of non-corrosive metal cemented in grooves, with abutting slab edges sealed with acid-proof cement. Fume hoods, sinks and tanks are assembled with tongue-and-groove joints held by hidden bolts and nuts and cemented—permanently gas and liquid tight.

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Every laboratory of major importance equipped in the past 50 years has used Alberene soapstone wholly or in large part. If you have a war training course you will undoubtedly need additional equipment. Let us help. We have the experience and the facilities.

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Quarries and mills at Schuyler, Virginia, are the largest in the world devoted exclusively to the production and fabrication of special purpose stone.



Section of Chemical Engineering Laboratory, Rensselaer Polytechnic Institute, Troy, N. Y.

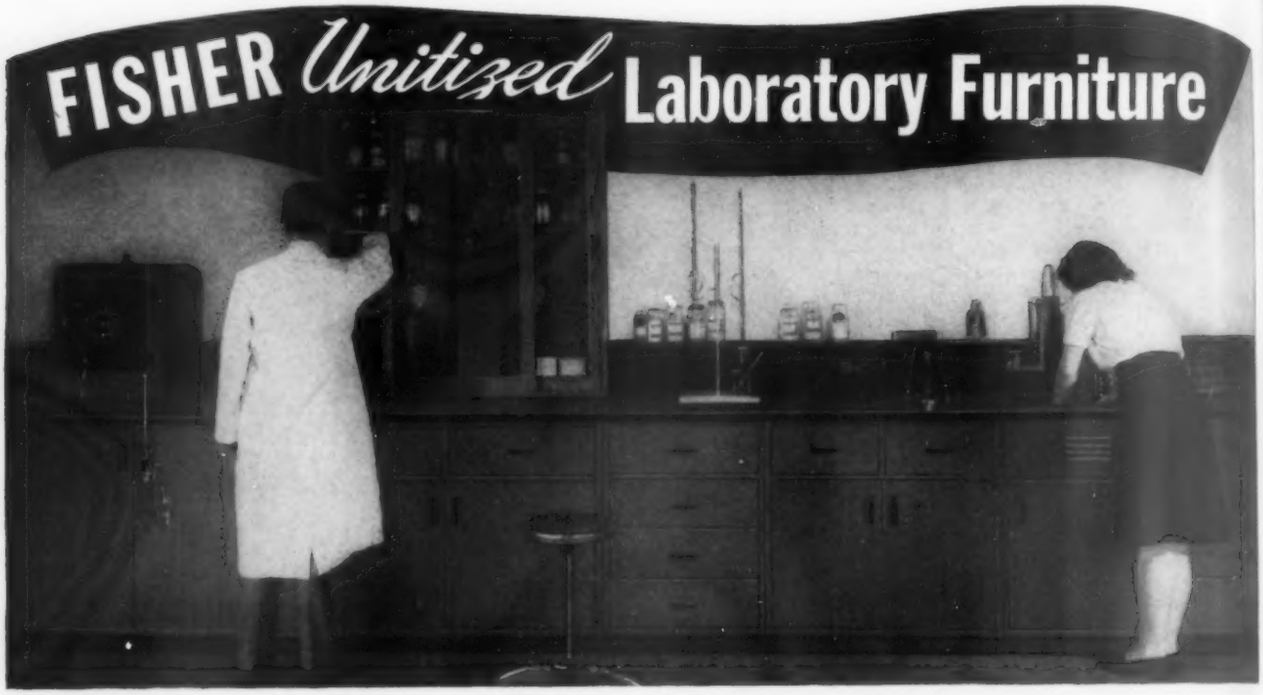


Alberene Stone Stair Treads and Platforms in Woodrow Wilson High School, Washington, D. C. Nathan C. Wyeth, Municipal Architect

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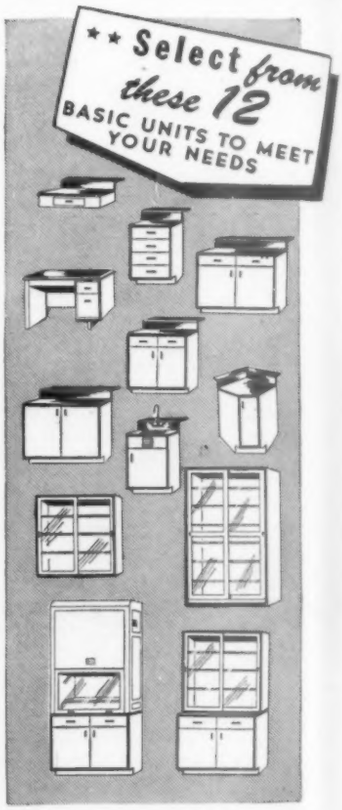
FISHER *Unitized* Laboratory Furniture



The completely new system for equipping laboratories which is offered by Fisher Unitized Laboratory Furniture is particularly adaptable to educational needs since the units can be selected as required, ordered direct from stock and installed in a few hours' time. Thus, it is much more simple to add to existing installations or to set up a small laboratory for permanent or semi-permanent use.

Fisher Unitized Laboratory Furniture is attractive, gives long service and is economical. The construction is of first quality with all-steel bases and Kemrock working surfaces. Units are joined by means of bolts and can be assembled by any handy man.

In addition to the usual drawer and cupboard Units, the Fisher Furniture includes special-purpose Units such as a sink, corner unit, fume hood and table unit. By planning the laboratory according to the available space, it is possible to fit any dimension within one foot. Reagent shelves are furnished with each unit and the necessary hardware is available as accessories.



Write for a free catalog describing Fisher Unitized Laboratory Furniture

HEADQUARTERS FOR LABORATORY SUPPLIES

Fisher Unitized Laboratory Furniture further extends the service of Fisher and Eimer & Amend to educational laboratories. It can now be obtained along with scientific instruments, modern apparatus and high purity reagents from any of the conveniently located plants shown above.

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(CHEMICAL EQUIPMENT DIVISION)

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A complete line of acid-proof chemical stoneware and porcelain equipment for chemistry and physics laboratories in educational and research institutions for general industrial chemical purposes, and for hospitals, electroplating plants, newspapers, photo-engraving shops and other establishments where corrosive fluids are used. The line includes laboratory sinks, drain lines and fittings, sumps, fume ducts, pumps and ventilating fans.

A list of colleges and universities with chemical laboratories equipped with General Ceramics Chemical Stoneware and Porcelain is practically a roster of our leading institutions of learning. Installations have also been made in Walter Reed Hospital, Washington, Curtis Publishing Company in Philadelphia and New York, The Times Building and United States Assay Office.

Chemical Stoneware

General Ceramics Chemical Stoneware is a dense granite-like material with an attractively glazed surface. Both the glaze and the body of the ware are completely impervious to all acids and other chemicals, excepting hydrofluoric acid. It is mechanically strong, leakproof, easy to clean and lasts indefinitely.

General Ceramics one piece construction has the advantage of eliminating joints, the sinks being made in one piece with integral drainboard, backs, tail piece, overflows, traps, etc., as desired. The sink bottoms are made with a fall toward the outlet to insure complete drainage. There are no sharp corners at the sides and bottom, as these are rounded to facilitate cleaning. The glaze is an integral part of the body and will not craze or peel and gives a smooth attractive finish that will not accumulate slime and is easy to keep clean. The color is a rich chocolate brown that retains its attractive appearance even when soiled.



Laboratory sink with double drainboard in either Chemical Stoneware or Porcelain. Can be furnished without the integral back, with single drainboard and with details of construction as required

Cerawite Chemical Porcelain

Cerawite is a new chemical porcelain, completely vitrified, high fired, non-porous. Has greater mechanical strength and resistance to thermal shock than it has been possible heretofore to combine in one ceramic body. This corrosion resistant body withstands extremely stringent conditions.



Laboratory sink, Chemical Stoneware or Porcelain, with integral back and side. Can be furnished without back and side in various types and sizes as required

Engineering Service

We offer competent engineering service in the design of stoneware, porcelain or special chemical equipment and in the planning and layout of laboratories and in other buildings where corrosive products are handled. Bulletins on General Ceramics laboratory sinks and on acid-proof pipe and fittings will be furnished on request.

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Acid Waste Pipe and Fittings
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Knight-Ware is an improved ceramic material that is dense, tough and wholly inert to the action of chemical solutions or gases, weak or strong, hot or cold (Hydrofluoric acid and hot caustic solutions excepted). Its acid-proof quality does not depend upon any glaze or surface treatment. "It is the body itself" that is entirely acid-proof. Knight-Ware equipment, properly installed, is trouble-free and permanent.

LABORATORY SINKS

Knight-Ware sinks are custom-made to specified measurements without extra cost. The one-piece construction, smooth surfaces, rounded corners and acid-proof quality mean a freedom from leaks and a cleanliness that is permanent. Splash backs, drainboards, aprons and outlets of several styles may be had as integral parts of the sink. Bottoms are sloped to insure complete drainage. The finish is a rich brown salt glaze that will not stain or peel.

ACID WASTE PIPE AND FITTINGS

Knight-Ware pipe and fittings are made in standard designs in any bore from 1 to 60 inches and straight lengths up to 5 feet. Special pieces to fit unusual places or to eliminate extra joints are available at low cost. Knight-Ware pipe is light in weight, strong and acid-proof.

Joints, packed and poured to our specifications, are tight and lasting.

KNIGHT-WARE FUME DUCTS

Ventilating pipe is available in round or rectangular shapes in bores up to 60 inches and with bell and spigot, flanged or plain butt end connections. Specify Knight-Ware for lasting protection.

SERVICE

If you are planning a new laboratory or modernizing your present one, we offer our knowledge and practical experience gained from scores of Knight-Ware installations.

Our fully illustrated Laboratory Equipment catalog will be sent upon request.

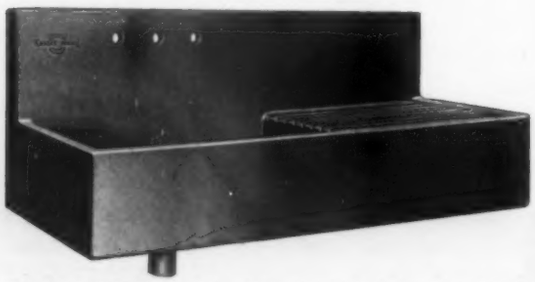


Fig. 237 RD Sink with right hand drainboard. Available with left hand or double drainboards and apron.



275A Table Trough

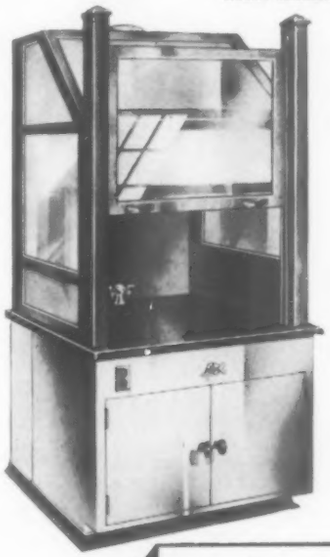


268 Knight-Ware S-Trap with Cleanout

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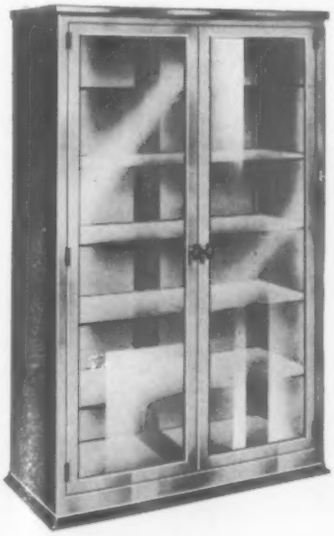
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Why not avail yourself of our Engineering Service which we will gladly furnish without obligation? This includes discussion of your problems, preparation of plans and specifications, and budget estimates.

Whether your problem is to plan a new project or add to the student accommodation of your present facilities our service will prove to be of valuable assistance.

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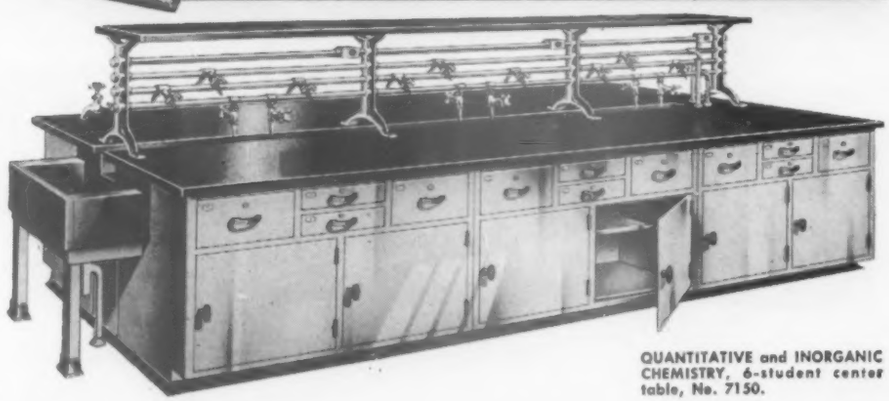
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WHAT CORROSIRON IS: An iron alloy, having a silicon content in excess of 14.25%, manufactured only by Pacific Foundry Company. A homogeneous alloy requiring neither treatment nor surface coating.

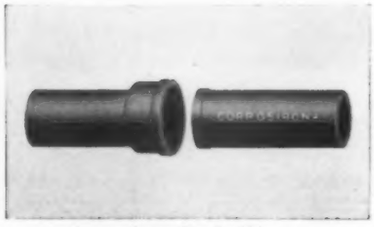
CHEMICAL PROPERTIES: CORROSIRON shows zero rate of corrosion when suspended in nitric acid or in nitrous fumes (two of most powerful corrosive agents known). Infinitesimal corrosion rates with all other acids * shown by tests by government and private agencies. Confirming, detailed data available on request.

WHERE USED: In high school, university, hospital and industrial laboratories for plumbing and fume exhaust systems in practically every state in the Union.

ITEMS AVAILABLE: CORROSIRON drain pipe and fittings (E. H. Std.) in all sizes. CORROSIRON fans, sizes 3 to 15 inch. Special acid handling equipment designed or furnished to your design.

REPUTATION: CORROSIRON, one of the first high silicon irons, has been manufactured and in satisfactory service for over 20 years. For more than a quarter century, Pacific Foundry Company has been building a reputation for quality rather than for quantity of the specialties which it manufactures. Full details of acceptance by Federal, State and school authorities on request.

USED FOR: Drain pipes and fittings, fans, laboratory acid digestion apparatus, sinks and other plumbing and fume exhaust systems.



Corrosiron Drain Pipe



Corrosiron Exhaust Fan



Corrosiron Drain Fittings

* Except hydrofluoric.

SPECIFICATION

All acid waste and acid vent piping shall be of approved high silicon cast iron bell and spigot type and shall contain: Not less than 14.25% and not more than 15% silicon; total carbon content below 1.00% and above .50%, manganese below .50%; sulphur below .05%

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MADE IN U.S.A.

HIGH SILICON ACID RESISTING IRON

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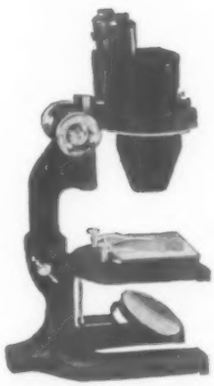
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STEREOSCOPIC MICROSCOPE

This Spencer No. 57 Junior Stereoscopic Microscope is moderately priced and well adapted to classroom work. It is particularly valuable for the study of flowers, molds, rocks, and other such material so interesting in the early approach to science. Either transmitted or reflected light may be used. It can be purchased with a single pair of objectives or two pairs in a revolving objective holder. Available optics provide a range of magnification from 8.1 to 70.8.

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This Spencer Magnifier provides a convenient means for studying small details. A horseshoe base, supporting the lens at proper focal distance from the object, simplifies dissection and manipulation of the specimen. The 4.5X doublet magnifier is corrected for chromatic and spherical aberrations and gives an extremely large, distortion-free field.





SPENCER NO. 66 MICROSCOPE

This instrument is particularly suited to student use in the biology laboratory. It is standard size with the same high quality optical equipment and mechanical features as on more expensive microscopes. It is equipped with a rack and pinion coarse adjustment, micrometer screw type fine adjustment, durable Bakelite stage, 110 mm. x 115 mm., and a dual-cone revolving nosepiece. Illumination is controlled by a revolving disc diaphragm and concave mirror. A substage condenser cannot be supplied with this instrument.



SPENCER SUBSTAGE LAMP

The No. 385 Substage Lamp is small, compact, and provides excellent illumination for average work with the microscope. Made of Bakelite, it is capable of withstanding the continuous hard usage of the laboratory.

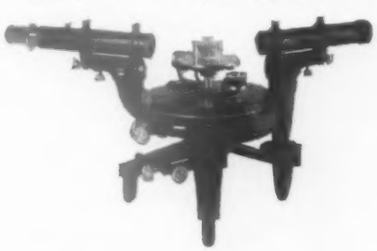


NO. 361 MICROSCOPE LAMP

Although this lamp is small and inexpensive it gives sufficient illumination for high power observation. Well ventilated, it can be handled comfortably at all times. A visor protects the eyes of the observer from stray light. The standard 60 watt bulb can be purchased at any electrical supply store.

SPENCER SPECTROMETER

This sturdy, adaptable graduated circle spectrometer with its various accessories constitutes much of the equipment needed in the study of optics. Experiments possible include examining the spectrum, measuring angles, determining wave length, and measuring refractive index. With available attachments this spectrometer becomes either a spectroscope or a spectrograph.



BAUSCH & LOMB OPTICAL COMPANY

655 St. Paul Street, Rochester 2, N. Y.

New York • Chicago • Boston • Los Angeles • San Francisco
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A MICROSCOPE

The Bausch & Lomb Model A Microscope is particularly recommended for use in elementary Botany, Zoology, and Biology classes in high school or college.

Its simple construction makes it the ideal instrument for the hard usage received in classroom service. Its optics are of the precision type.

Its features include the following: Vertical Monocular Body. Standard B&L rack and pinion coarse adjustment with patented lever type side fine adjustment. Designed to take spiral focusing sleeve substage adapting it to use with oil immersion objectives and making possible complete utilization of the full optical capabilities of the lower and intermediate power objectives. Revolving, dustproof nosepiece, centered and parfocalized at the factory.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A. and 43X (4 mm) 0.65 N.A. Double Nosepiece—Huygenian Eyepieces 5X and 10X. Cat. No. 31-21-40-04.

BA MICROSCOPE



The Bausch & Lomb Model BA Microscope is similar to the Model A but is equipped for more advanced work. A standard instrument in many hospital and professional laboratories, and a basic model in industrial and commercial laboratories, it is not only an ideal instrument for the teaching of microscopy, but it also familiarizes the student with the instrument he will be called upon to use in later professional or business life. Features include a built-on mechanical stage which holds slides 50 x 75 mm, permitting scanning of entire area, rack and pinion substage with Abbe Condenser 1.25 N.A. in full ring mount, complete adaptability to a wide range of accessories.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A. 43X (4 mm) 0.65 N.A. and 97X (1.8 mm) Oil Immersion 1.25 N.A. Triple Nosepiece—Huygenian Eyepieces 5X and 10X, Abbe Condenser 1.25 N.A. Cat. No. 31-21-55-08.



CTA MICROSCOPE

This microscope is especially adapted for advanced Biological work, for Medical Study and Diagnosis and as a general purpose microscope in universities. Has 30° inclined binocular body (interchangeable with monocular tube for photomicrography) with parallel eyepiece tubes. Built-on mechanical stage holds slides 50 x 75 mm, permitting examination of the entire area. Abbe Condenser 1.25 N.A. in full ring mount is in rack and pinion substage. Revolving, dustproof nosepiece, centered and parfocalized at the factory. Optical equipment of uniform high excellence includes achromatic and fluorite objectives.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A., 43X (4 mm) 0.65 N.A. and 97X (1.8 mm) Oil Immersion 1.25 N.A. Triple Nosepiece—Huygenian Eyepieces 5X and 10X, Abbe Condenser 1.25 N.A. Cat. No. 31-21-88-08.

FB MICROSCOPE



The model FB Microscope is designed to provide schools and colleges with a standard size microscope suitable for elementary biological work at an economical price. The features of this microscope provide for maximum usefulness while permitting sound microscopical training. A disc diaphragm, fitted below the stage, permits control of illumination. Standard B&L Achromatic Objectives and Huygenian Eyepieces are provided. Has double revolving nosepiece; large, adjustable, concave mirror for axial or oblique illumination; rugged fine adjustment.

Optical Equipment: Achromatic Objectives, 10X (16 mm) 0.25 N.A., 43X (4 mm) 0.65 N.A. Double Nosepiece—Huygenian Eyepieces 5X and 10X. Cat. No. 31-21-17-04.

KW TYPE STEREOSCOPIC MICROSCOPE



The great popularity of the KW Type Stereoscopic Microscopes has prompted us to offer them for use in schools and universities. Their range of magnifications, from 7X to 150X, especially suits them for biological and paleontological work. An interesting feature of this series is the patented vertically revolving drum nosepiece, holding three pairs of parfocal objectives in readiness to be swung instantly into place. This microscope gives stereoscopic, three dimensional effect. Image is upright and unreversed in exactly the same position it would be seen by the naked eye. Exceptionally wide field.

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B&L REFLECTOR LAMP



This lamp fills a definite need in work with both the monocular or binocular mon-objective microscope and the stereoscopic wide field microscopes. Elliptical mirror reflector with adjustment provides diverging, parallel or converging light.

Jointed arm mounting permits all-angle illumination above or below stage. With adjustable transformer, light intensity can be exactly fitted to the work in hand.

OTHER MICROSCOPE LAMPS

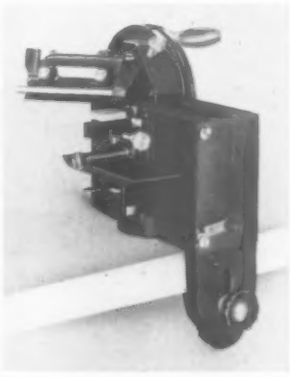




Other B&L Microscope Lamps are available for various purposes in the school laboratory. The one shown is the B&L Substage Lamp.

The entire group is completely described and illustrated in Catalog D-119.

B&L MICROTOMES



B&L offers a complete line of Microtomes. The Improved Clinical Microtome (illustrated) provides several desirable and exclusive operating advantages. It is a practical laboratory instrument, fitted for rapid and accurate sectioning of frozen, celloidin and paraffin material. Knife travel and feed are automatic, both being driven by a balanced handwheel of sufficient mass to insure smooth action on all material and section thicknesses of 5 to 75 microns in steps of 5 microns. Catalog D-16 describes the complete line.

B&L SPECTROGRAPHS



The complete B&L line of Spectrographic Equipment covers every need. Models range from the Bunsen Spectroscope (illustrated) for elementary class room work to the Large Littrow Spectrograph for examining complex alloys. Each is designed and built with the utmost care and due to our great experience in this field represents all of the best features necessary for both teaching and laboratory research. Catalogs D-26 and D-20 give complete details.

B&L MAGNIFIERS



Of great usefulness in the school laboratory, Bausch & Lomb Hastings Triplet Magnifiers are highly corrected for spherical and chromatic aberration, and have a wide angle of view as well. Magnifications available range from 7X to 20X. Other types of magnifiers for various purposes are available. Catalog I-15.

SEND FOR CATALOGS

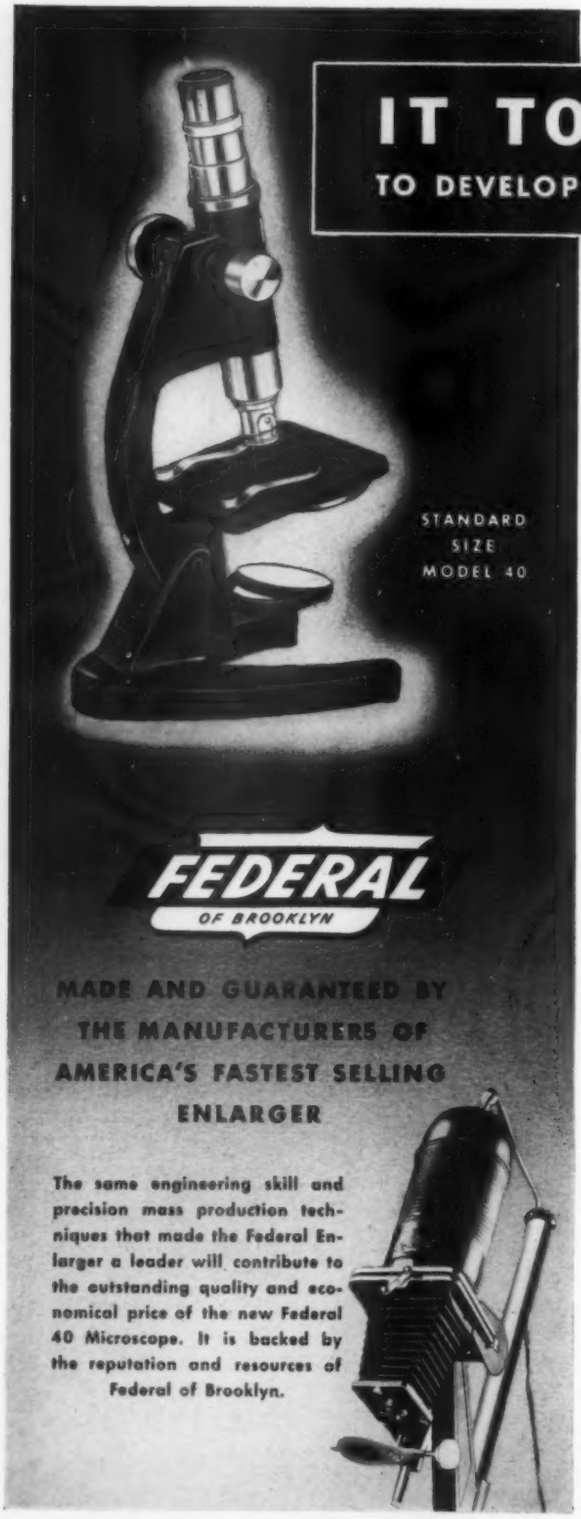
For complete information on Laboratory Microscopes and Accessories send for Catalogs D-185 and D-184. For information on Research Microscopes ask for Catalog D-173. For information on B&L Balopticons see pages 358, 359 this catalog. Remember the instruments listed on these pages are but a small part of the B&L Line. If you have need for information on any optical products, Bausch & Lomb will gladly be of service to you.

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- Tilting Frame.
- Large concave mirror.
- Full size stage with acid-resistant finish.
- Rack and pinion coarse adjustment and a new type of fine adjustment which eliminates all danger of damaging the objective or breaking the slide.
- Fine optics which include a 5X and 10X Huygenian eye piece and a convertible achromatic objective lens. The optical system gives you great clarity of detail for either low power or high power work ranging from 50X to 260X magnification.

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Approximately 1,000 chemicals bear the Baker & Adamson label. The reagents shown below are but a small cross-section of the many B & A purity products available. For full information, consult the nearest General Chemical Sales and Technical Service Office or write to the Baker & Adamson Division, General Chemical Company, 40 Rector Street, New York 6, N. Y.

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- *Acid Hydrochloric, Sp. Gr. 1.18, Reagent, A. C. S.*
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- *Acid Nitric, Sp. Gr. 1.42, Reagent, A. C. S.*
- *Acid Nitric, Red Fuming, Sp. Gr. 1.49-1.50, Reagent*
- *Acid Oxalic, Cryst., Reagent, A. C. S.*
- *Acid Perchloric, 70-72%, Reagent, A. C. S.*
- *Acid Sulfuric, Sp. Gr. 1.84, Low N, Reagent, A. C. S.*
- *Ammonium Chloride, Gran., Reagent, A. C. S.*
- *Ammonium Hydroxide, Sp. Gr. 0.90, Reagent, A. C. S.*
- *Ammonium Oxalate, Cryst., Reagent, A. C. S.*
- *Ammonium Phosphate, Dibasic, Cryst., Reagent, A. C. S.*
- *Barium Chloride, Cryst., Reagent, A. C. S.*
- *Benzene (Benzol), Thiophene Free, Reagent, A. C. S.*
- *Bromine, Reagent, A. C. S.*
- *Calcium Chloride, Anhydrous, Reagent, A. C. S. and Purified*
- *Calcium Oxide, Powder, Reagent*
- *Carbon Disulfide, Reagent, A. C. S. and C. P.*
- *Carbon Tetrachloride, Reagent, A. C. S. and C. P.*
- *Cuprous Chloride, Powder, Reagent, A. C. S. and Tech.*
- *Ether, Anhydrous, Reagent, A. C. S.*
- *Filter Paper—Grade "O"*
- *Iodine, Resublimed, Reagent, A. C. S. and U. S. P.*
- *Magnesium Chloride, Cryst., Reagent, A. C. S.*
- *Manganous Sulfate, Monohydrate, Reagent, A. C. S.*
- *Mercury Metal, Redistilled, Reagent, A. C. S.*
- *Potassium Acetate, Cryst., Reagent and U. S. P.*
- *Potassium Carbonate, Anhydrous, Reagent, A. C. S.*
- *Potassium Chloride, Cryst., Reagent, A. C. S.*
- *Potassium Cyanate, Cryst., Reagent and Purified*
- *Potassium Iodide, Cryst., Reagent, A. C. S. and U. S. P.*
- *Sodium Acetate, Cryst., Reagent, A. C. S.*
- *Sodium Carbonate, Anhydrous, Reagent, A. C. S.*
- *Sodium Fluoride, Powder, Reagent, A. C. S.*
- *Sodium Hydroxide, Chip, Reagent, A. C. S.*
- *Sodium Oxalate, Powder, Reagent, A. C. S.*
- *Sodium Thiosulfate Cryst., Reagent, A. C. S.*

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"REAGENT" GRADE: The highest grade available; products conforming to American Chemical Society specifications are marked "A. C. S." On reagents not covered by A. C. S. specifications, Baker & Adamson has established standards of purity for the individual products which will permit the use of these chemicals in the most exacting work. Maximum limits of allowable impurities are shown on the labels of products classified as "Reagent." These limits are very low; all materials shipped meet these uniform standards.

"C. P." GRADE: A few of the common chemicals are offered under the "C. P." designation. This quality, while not equal to the "Reagent" quality, is nevertheless suitable for many routine uses in educational and other laboratories.

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B & A REAGENT ACIDS AND AMMONIA, meeting A. C. S. specifications, are available in 5-pint and one-pound screw-cap bottles as well as in carboys. Both types of bottles have the highly desirable pour-clean feature and are fitted with plastic caps, making them ideal for immediate use on laboratory shelves.

B & A LABEL COLOR CODE of product identification for reagent acids and ammonia is designed to save time and to prevent errors. This color code is particularly helpful in the school laboratory.

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Our NEW FILT analytical grades, which we developed sometime ago, have been used by chemists the world over, giving excellent results. They were created to replace the foreign single-acid washed papers to be used for any analytical procedure where a strictly double-acid washed paper is not necessary. They are made of the very highest quality of pure cotton fibre and are specially treated and processed to insure a high degree of purity and a low ash weight. The NEW FILT grades, Nos. 1, 3, and 4, have an ash weight the equivalent of any single-acid washed imported paper.



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Grade	Thickness	Basic Weight	Color	Surface	Texture	Average Rapidity
603	0.010″	32 lbs.	White	Smooth	Close	50 cc per Min.
605	0.007″	28 lbs.	White	Smooth	Close	50 cc per Min.
608	0.013″	40 lbs.	White	Embossed	Very Close	25 cc per Min.
611	0.004″	16 lbs.	White	Smooth	Very Close	80 cc per Min.
612	0.008″	20 lbs.	White	Embossed	Med. Close	60 cc per Min.
613	0.006″	20 lbs.	White	Smooth	Very Close	60 cc per Min.
614	0.006″	13 lbs.	White	Creped	Very Open	500 cc per Min.
615	0.010″	20 lbs.	White	Creped	Fairly Open	250 cc per Min.
616	0.015″	28 lbs.	White	Creped	Open	300 cc per Min.
617	0.018″	35 lbs.	White	Creped	Open	300 cc per Min.
619	0.010″	20 lbs.	Grey	Creped	Fairly Open	250 cc per Min.
620	0.009″	20 lbs.	Grey	Creped	Fairly Close	60 cc per Min.
622	0.006″	20 lbs.	White	Embossed	Close	30 cc per Min.
622	0.006″	20 lbs.	Grey	Embossed	Close	30 cc per Min.
623	0.026″	70 lbs.	White	Smooth	Med. Close	180 cc per Min.
623	0.030″	78 lbs.	White	Smooth	Med. Close	180 cc per Min.
623	0.038″	95 lbs.	White	Smooth	Med. Close	90 cc per Min.
624	0.022″	63 lbs.	White	Smooth	Close	160 cc per Min.
625	0.026″	70 lbs.	White	Smooth	Close	160 cc per Min.
625	0.030″	78 lbs.	White	Smooth	Close	160 cc per Min.
627	0.023″	65 lbs.	White	Smooth	Close	100 cc per Min.
627	0.026″	75 lbs.	White	Smooth	Close	80 cc per Min.
627	0.030″	85 lbs.	White	Smooth	Close	80 cc per Min.
628	0.026″	75 lbs.	Tan	Embossed	Med. Close	80 cc per Min.
628	0.035″	95 lbs.	Tan	Embossed	Med. Close	50 cc per Min.
629	0.012″	35 lbs.	White	Smooth	Med. Close	100 cc per Min.
632	0.042″	84 lbs.	White	Creped	Close	60 cc per Min.
633	0.042″	70 lbs.	White	Creped	Open	400 cc per Min.
633	0.045″	75 lbs.	White	Creped	Open	350 cc per Min.
633	0.045″	81 lbs.	White	Creped	Open	300 cc per Min.
634	0.030″	54 lbs.	White	Creped	Med. Open	450 cc per Min.
637	0.013″	28 lbs.	White	Creped	Open	700 cc per Min.
639	0.014″	28 lbs.	Tan	Creped	Very Close	200 cc per Min.
640	0.022″	44 lbs.	White	Creped	Open	400 cc per Min.
641	0.014″	41 lbs.	White	Smooth	Close	120 cc per Min.
644	0.020″	54 lbs.	White	Smooth	Open	220 cc per Min.
646	0.020″	48 lbs.	White	Smooth	Med. Close	160 cc per Min.
652	0.050″	150 lbs.	White	Smooth	Very Close	25 cc per Min.
655	0.005″	15 lbs.	White	Creped	Med. Close	200 cc per Min.
301	0.030″	90 lbs.	White	Smooth	Close	80 cc per Min.
301	0.050″	145 lbs.	White	Smooth	Close	50 cc per Min.
320	0.090″	225 lbs.	White	Smooth	Very Open	150 cc per Min.

NOTE: In above description "**basic weight**" is for 500 sheets per ream size 20″ x 20″. Rapidity is the number of cubic centimeters of distilled water at 25° centigrade filtered per min. through 2″ hole using a 2″ head.

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Model 7001	Inside	5" x 5½" x 6"	110 volt	85 lbs.	.....	$ 60.00
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A stainless steel bath, for constant temperature ranges from room to 100 C., with a temperature differential of ½° C. plus or minus. The bath is well insulated, has a constant level device and an adjustable bi-metallic thermostat. Comes equipped with thermometer, shelf, and pilot light. Can be had with gable or concentric ring cover. Three sizes from 6" x 12" x 6" to 18" x 24" x 9". Prices range from $100.00 to $250.00.

GRAVITY CONVECTED OVENS, STERILIZERS, AND BACTERIOLOGICAL INCUBATORS



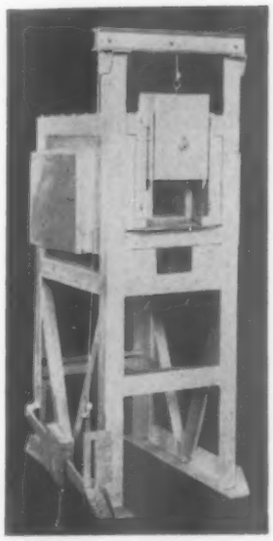
Constructed of stainless steel interior, and enameled grey exterior. Adjustable, constant temperature, thermostat and low gradient heaters allow close control from 2° C. differential on the sterilizers to ½° C. differential on Incubators. Designed to provide a slow rate of heat transfer at uniform and accurate temperatures from room to 260° C., depending on the model selected. Three sizes ranging from 1 to 10 cubic feet, within a price range of $120.00 to $450.00.

ALL PRICES F.O.B. FOX CHASE, PA.

HARPER ELECTRIC FURNACE CORPORATION

1440 Buffalo Avenue • Niagara Falls, N. Y.

INCORPORATED 1924

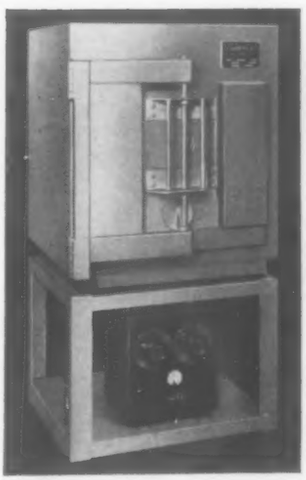


The complete range of Harper Electric Furnaces fits the diversified requirements of schools and universities. Their design is a result of long experience in building special furnaces for industrial operations including high temperature heat treating, assaying, ceramic firing, sintering powdered metals and other high temperature work.



HEAT TREATING FURNACES

This general utility furnace gives temperatures up to 2750° F. with "Globar" non-metallic heating elements. Harper design assures uniform temperature distribution and control. Floor and bench models—various sizes. Write for data.

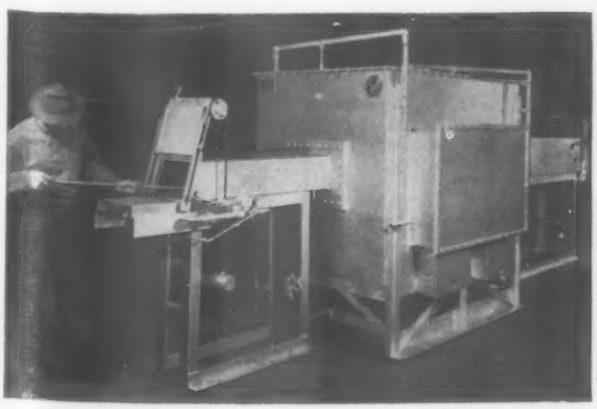


POWDERED METAL SINTERING FURNACES

The attention of industry is focused on the precision and economy of powdered metallurgy. Harper Sintering Furnaces, shown below, perform purging, heating and cooling operations in one straight-through handling. Write for data.

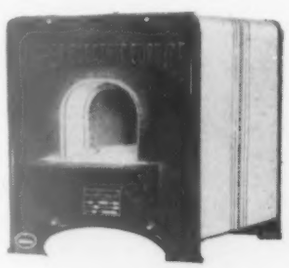
ELECTRIC KILNS

Uniform temperature distribution and accuracy of control plus ability to produce and reproduce difficult firing cycles are Harper performance features. True sparkling glaze colors are produced when ware is fired in the uncontaminated kiln atmosphere which is present in Harper kilns equipped with "Globar" non-metallic heating elements. Typical kilns illustrated above and at left. Write for data.



LABORATORY FURNACES →

Provide rapid heating to temperatures from 1500° F. to 2750° F. Uses include alloy, cement, and glass melting tests, dehydration and oxidation, calcining, preparing enamel frits, etc. Equipped with non-metallic heating elements, muffle and plug type doors. Write for data.



WRITE FOR DATA ON HARPER HIGH TEMPERATURE ELECTRIC FURNACES

LABORATORY CONSTRUCTION CO.

1115 Holmes Street, Kansas City 6, Missouri, U. S. A.

Manufacturers of Apparatus and Equipment for Agricultural, Nutritional, Agronomy, and General Food and Feed Testing Laboratories

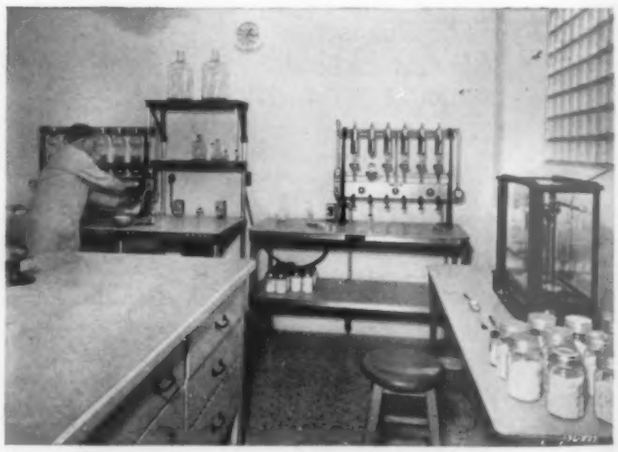


KJELDAHL NITROGEN APPARATUS for protein determinations. Shown on left is 6 unit electric combination digestion and distillation unit. Available in units of 6 to 24 and larger capacity where digestion and distillation are separate. Gas or electric heat.

Guaranteed fume disposal by patented air ejector. Tubular cast enbloc condensers. Many exclusive features, the result of twenty years of specialized experience and development.

(Right) Corner of modern laboratory where oil and fiber content is determined with the "Goldfisch" ether extraction apparatus (Far right) and the Crude Fiber Condenser. Both available in units of 2, 4, and 6 capacity and complete with all glassware, ready to operate.

Both are well accepted in hundreds of laboratories and have proven efficient, durable, and faster.



● KJELDAHL NITROGEN APPARATUS ● "GOLDFISCH" FAT EXTRACTORS ● CRUDE FIBER CONDENSERS ● HOODS ● ACID PROOF SINKS AND DISPENSING STANDS ● LABORATORY CARTS ● "LABCONCO" GAS BURNERS AND ACCESSORIES ● "GOLDFISCH" ELECTRIC HEATERS AND ACCESSORIES ● GRINDERS ● GENERAL AND SPECIALIZED STEEL LABORATORY TABLES

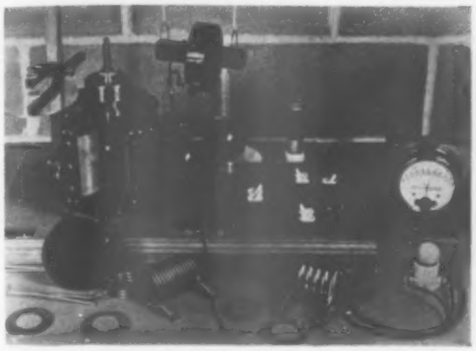
COMPLETE DETAILS UPON REQUEST

UNIVERSAL SCIENTIFIC CO., INC.

Vincennes, Indiana

PLAN NOW TO USE CROW'S DEMONSTRATION EQUIPMENT

FOR CLASSROOM AND LABORATORY INSTRUCTION PROGRAMS



Model 500G Crow's Demonstration Unit

DYNAMIC . . .

ELECTRICAL . . .

MAGNETIC . . .

ROTATING . . .

ELECTRONIC . . .



Instructor Demonstrating Operation of Compound D.-C. Motor Generator Unit Using Crow's Rotating Machine Units

ELECTRO-DYNAMIC AND MAGNETIC EQUIPMENT

It is a relatively simple matter to set up Crow's electro-dynamic and magnetic equipment, illustrated above, and to demonstrate, with astonishing reality, such common apparatus as the split-phase motor, shaded-pole motor, transformer, generator, saturable core reactor, illumination control circuits, electrical and magnetic laws, etc. In fact, but very few machines or circuits are beyond the scope of this truly versatile equipment. The laws of magnetism, electro-magnetism, electromagnetic induction, and electrical heating—only to mention a few—assume a more practical and interesting significance, as the basic principles are studied by the actual performance of carefully arranged and interesting experiments. The use of the large Model 500G Demonstration Unit in the classroom, combined with a proper number of Model 100G Individual Demonstration Units in the laboratory, makes possible a genuine student participation instruction program the practical utility of which cannot be equaled by any other means.

ROTATING ELECTRIC MACHINE EQUIPMENT

This equipment has been specially designed to visually demonstrate the construction, theory and principles of operation, of Rotating Electrical Machines. The points of similarity and difference in construction, as well as of theory of operation of over 50 different types of Rotating Electrical Machines can be quickly demonstrated by merely rearranging the assembly of the parts of the apparatus. With the component coils, armatures, field windings and supports which comprise our Rotating Machine Equipment, the performance characteristics of every common type of alternating current and direct current generator, transformers, converters, selsyn indicating devices—in fact, every available type of commercial machine, including the derivation of performance curves, can be demonstrated with spectacular realism. One of these machine units will do the work of dozens of single-purpose commercial machines, and, permit a superior type of instruction procedure.

—CROW'S —UNIVERSAL ELECTRICAL DEMONSTRATION EQUIPMENT—

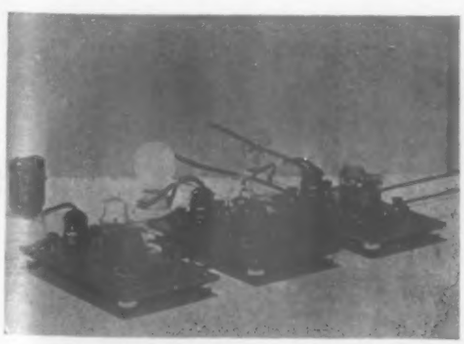
Without obligation, we will be very glad to furnish any interested individual complete price information and descriptive literature covering the equipment which is listed on this page, including performance characteristic curves. IMMEDIATE DELIVERY CAN BE MADE FROM STOCK OF ALL ITEMS ILLUSTRATED ON THIS PAGE. Your inquiries are solicited. Our engineers will be very glad to lend to you the benefit resulting from their many years of experience in the classroom and laboratory, and to assist you in the selection of the most suitable equipment to fit your specific requirements.

ELECTRONIC AND RADIO EQUIPMENT

The standard curricula of the modern trade and vocational school, as well as that of the more progressive college and university engineering departments, are being reinforced by the introduction of basic courses covering Industrial Electronic applications, as well as Communication applications. The Electronic and Radio equipment offered by the Universal Scientific Company, Inc., is of basic design, and to provide for instruction covering such applications as Carrier-Current Control circuits, Electronic Motor Control units, Inductive and Electrostatic Heating, Oscillators and Transmitters, Photo-Tube Control, and other miscellaneous applications. The flexibility in design of the equipment permits broad application, and consequently, can be utilized to encourage initiative on the part of the student, in the way of independent experimentation.

CIRCUIT ANALYSIS EQUIPMENT

To the instructor who desires equipment for student participation exercises, and to permit instruction in basic circuit analysis, we direct your attention to the Model 100G Demonstration Unit, and to a series of Unit-Boards which consist of mounted receptacles, switches of various types, bells, pushbuttons, etc. Flexible jumpers are used. A series of these boards, properly arranged and mounted in the laboratory or shop, will permit basic and thorough instruction in Circuit Analysis and Circuit Orientation. The number of possible circuit combinations, which can be erected with this series of Unit-Boards, is almost innumerable! A companion Manual, containing a corresponding series of progressively more intricate circuit combinations, accompanies each Unit-Board, thus permitting correspondingly progressive instruction. By a suitable selection of Unit-Boards, an entire class-group can be accommodated, and an entire semester's laboratory program can be carried out with but a comparatively small investment.



Multi-Channel Electronic Carrier-Current Control Unit

For Additional Information on These Important Teaching AIDS, Please Write:

Engineering Department

UNIVERSAL SCIENTIFIC COMPANY, INC.

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Student Participation Group Using Crow's Model 100G Demonstration Unit

WM. WURDACK ELECTRIC MFG. CO.

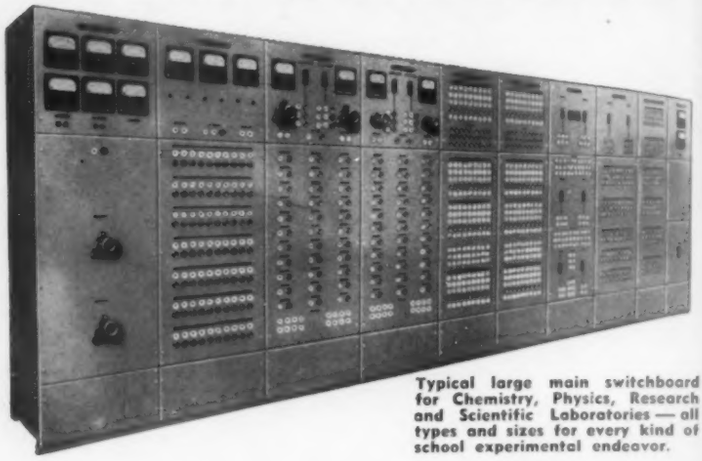
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Experimental Laboratory Switchboards and Light and Power Distribution Boards



Wurdack Laboratory Switching and Control Equipment is designed to facilitate scientific research and experimental work in schools and colleges. Electrical energy is extended from the Main Switchboard to classrooms, tables and laboratories.

MAIN SWITCHBOARDS AND SUB-SWITCHBOARDS FOR CHEMISTRY AND PHYSICS LABORATORIES



Typical large main switchboard for Chemistry, Physics, Research and Scientific Laboratories — all types and sizes for every kind of school experimental endeavor.



WURDACK SERVICE OUTLETS

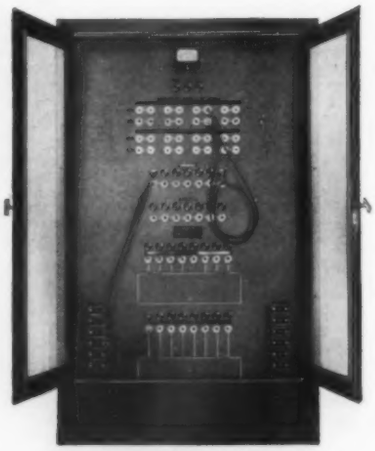
Enclosed service outlets for table or pedestal mounting. Supplied with base to rigidly support outlet and conceal conduits. In various combinations including single and double face.



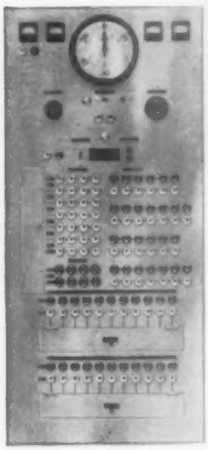
Flush type service outlets in all types of combinations supplied with recess box of code guage steel for mounting flush in work tables, desks or in walls.



Wurdack Cord Sets, color coded, are supplied with male and female plugs — spade lugs or pin plugs.



Glass enclosed type of sub-switchboard installed in College Physics Laboratory.



Laboratory Switchboard with Telechron Timer installed in small high schools.



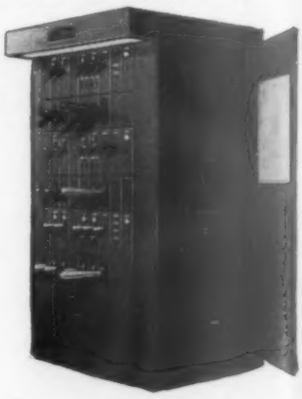
POWER AND LIGHT DISTRIBUTION SWITCHBOARDS

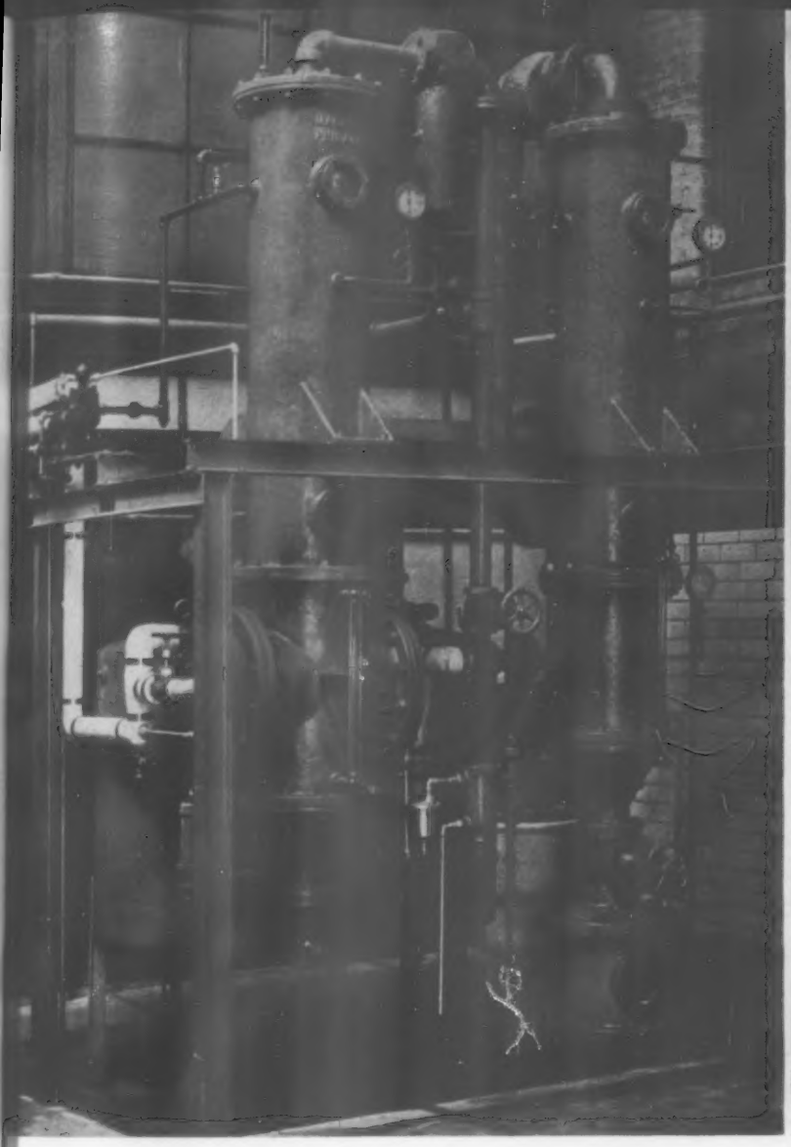
Wurdack supplies the finest in modern fusible and circuit breaker electrical distribution panelboards and switchboards for the control of light and power in schools, colleges, etc.

AUDITORIUM AND STAGE LIGHTING SWITCHBOARDS

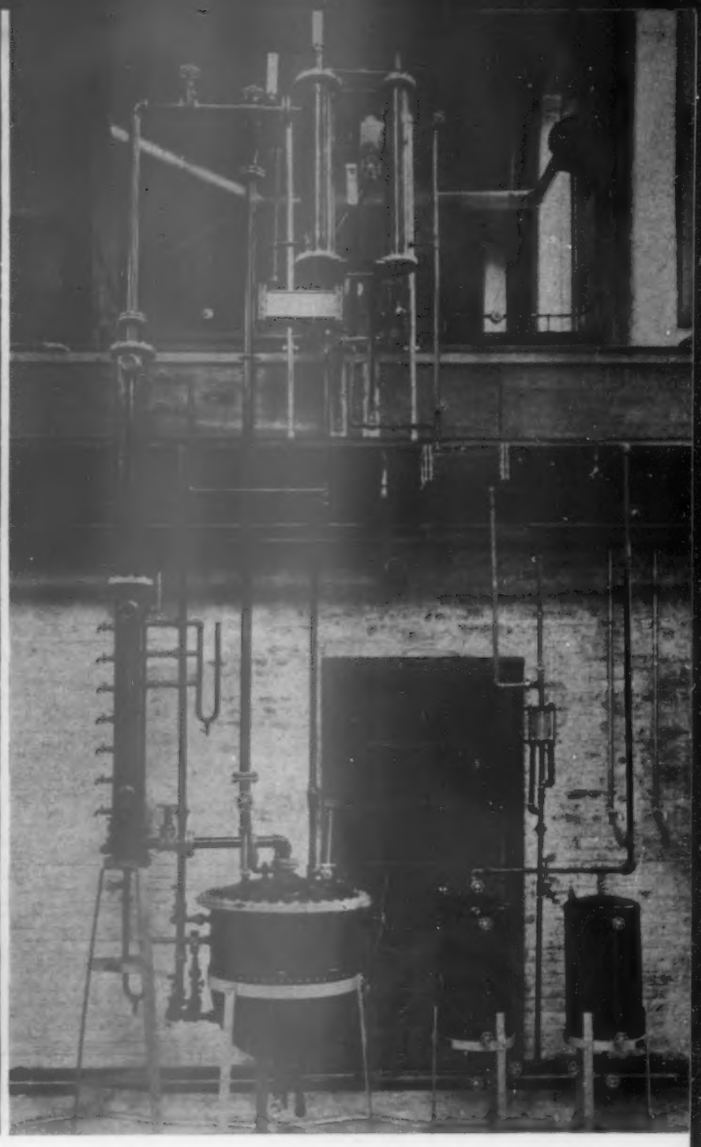
The Wurdack Flexi-Lite Pilot and Dimmer Control is recommended for schools, colleges and dramatic centers. Designed for ease of operation and great flexibility.

Send for special Wurdack Catalogs on Experimental Laboratory Switchboards, on Fusible Panelboards and on Circuit Breaker Panelboards. Wurdack engineers are always at your service for consultation on electrical control equipment.





Double Effect Evaporator. Either effect can be used separately. Gages, thermometers, testers and measuring tanks permit collection of comprehensive inquiry data on a variety of operations. Several other standard models are available



Fractionating Column. Can be operated at atmospheric pressure or under vacuum. Double receiver permits separation of fractions distilled over. By-pass line used for open steam distillations. Numerous thermometers, sampling cocks and rotometers permit collection of comprehensive inquiry data on a variety of operations

STOKES *Special* EQUIPMENT
for Teaching and Research

We have had the privilege of working with the directors of the Frick Laboratory at Princeton, the chemical engineering laboratories at the Universities of Columbia, Pennsylvania, Tulane, Florida, Penn State College, University of Shanghai and others, both here and abroad. We have engineered and manufactured equipment in great variety, for both laboratory and industrial purposes, for more than 50 years.

This broad experience enables our engineers to cooperate with you in a most practical way in designing and building the type of apparatus you require, apparatus so designed that data may be obtained for the demonstration of basic principles in teaching or research activities.

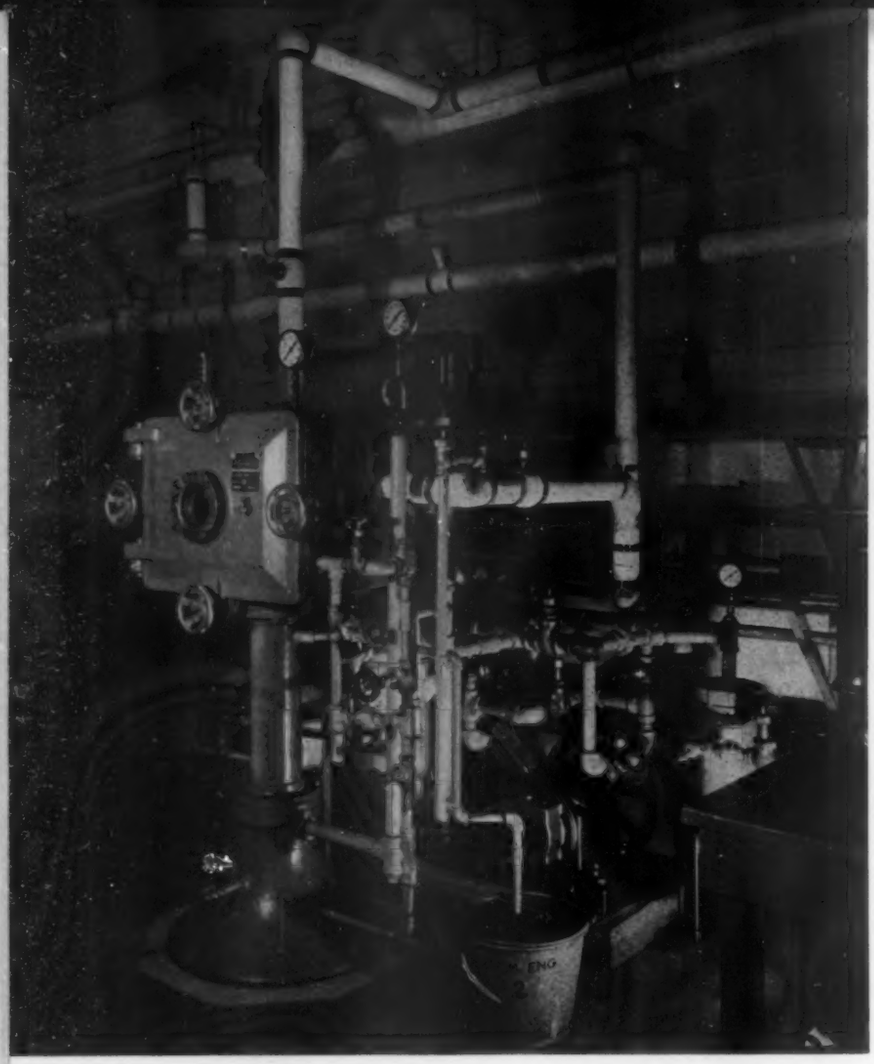
Consult with us about equipment needed to develop or expand your facilities . . . Dryers, Evaporators, Distilling or other special apparatus and for Water Stills, Vacuum Dryers, High Vacuum Pumps and Gages, etc. We know how to build equipment *economically* to best meet special requirements . . . will be glad to make specific suggestions and recommendations, if you will state your problem.

F. J. STOKES MACHINE COMPANY

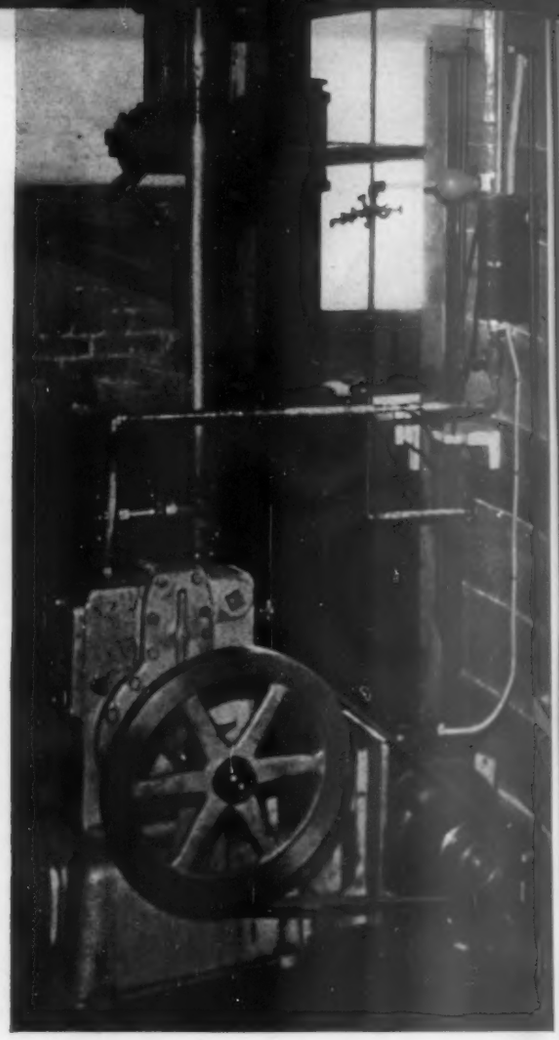
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Vacuum Shelf Dryer at Cooper Union, N. Y. Used for running tests on all kinds of materials. Piped to circulate hot water or steam through shelves. Equipped with thermocouples to measure temperature of materials. Vertical surface condenser is built into base. Two-cylinder vacuum pump arranged so that cylinders can be used separately on dryer and other apparatus or together as a two-stage unit for high vacuum. Installation includes small steam boiler and steam-water mixing chamber



Stokes High Vacuum Pump, 10 cu. ft. per min. capacity, installed at Indiana University. Stokes pumps are used at Columbia University, Pratt Institute, Cornell University and other schools

HIGHER VACUUM

—and its Widening Applications

As you know, there is a growing trend toward the use of higher vacuum by Industry. It is being successfully applied to an ever-widening variety of operations . . . to dry penicillin, plasma, streptomycin and other biologicals by sublimation; evaporation of metals and metallic salts; distillation of vitamin oils, essential oils, aromatics; evacuation of light bulbs, radio tubes, television and other electronic tubes; impregnation of textiles, wood, etc.; low temperature drying of foods, chemicals and pharmaceuticals.

These are only a few of the things that are today being done better . . . and more economically . . . under higher vacuum. But improved methods call for specialized knowledge and training. To successfully demonstrate their applications and advantages requires laboratory equipment designed to duplicate actual full-scale manufacturing procedure.

We were pioneers in the field of higher vacuum . . . for more than 35 years have contributed, by way of research, engineering and the development of equipment, to the advancement of high vacuum methods. Typical Stokes laboratory equipment, such as shown on these two pages, is simple, basic, practical apparatus. It is of the same type, design and construction as that we build for Industry . . . adapted to teaching, research or demonstrating actual manufacturing technique.

We should be pleased to consult with you. Catalogs on equipment in which you may be interested will be sent promptly.



MICROVAC PUMPS

Research at higher vacuum, within a few microns of absolute, can be undertaken with assurance in laboratories equipped with Stokes High Vacuum Pumps. These laboratory size pumps are identical in design with the larger Stokes pumps used by Industry . . . rugged, simple, foolproof, with high mechanical and volumetric efficiencies.

There are only four internal moving parts in these pumps. They have no dead space, or clearance; discharge of air at the end of each stroke is complete.

A built-in Oil Clarifier continuously removes moisture from the oil; even sudden slugs of liquid are discharged without loss of vacuum. A Solvent Stripper can be furnished to remove and reclaim solvents. Many other exclusive features.

Write for bulletin.

A FEW USERS OF STOKES EQUIPMENT

Columbia University ★ University of Detroit ★ Phila. College of Pharmacy and Science ★ Oregon State College ★ Kansas State College ★ Tulane University of Louisiana ★ University of Pennsylvania ★ West Virginia University ★ Princeton University ★ University of Florida ★ Pennsylvania State College ★ Clarkson College ★ Chiao Tung University (Shanghai) ★ National University of Chekiang (Hangchow) ★ Cooper Union ★ Pratt Institute ★ Lafayette College.

STOKES CATALOGS

High Vacuum Pumps. Ask for Bulletin 463.

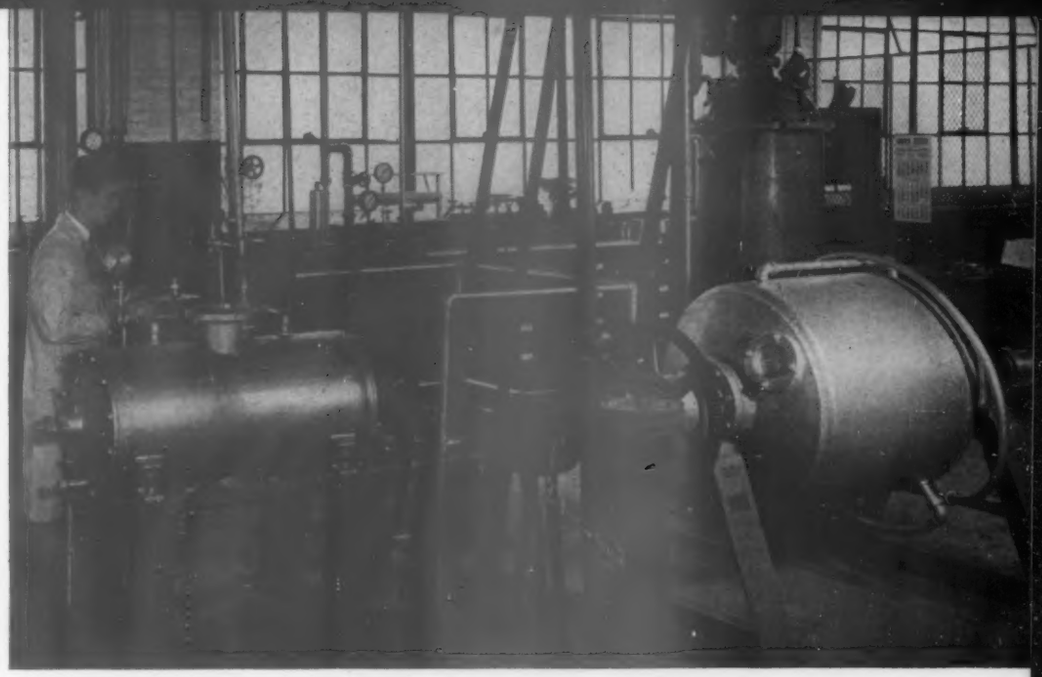
Processing Equipment. Describes laboratory and industrial equipment, atmospheric and vacuum types. Catalog 46-C.

Water Stills. Describes laboratory stills. Capacities up to 100 g.p.h. Electric, gas, steam-heated models. Catalog No. 41-S.

Pharmaceutical Equipment. Includes laboratory equipment, and Tablet Machines. Catalog 42-T.

High Vacuum Gages. See description above. Bulletin 45-G.

Tablet Compressing Machines. Catalog No. 41-T.



LABORATORY VACUUM EQUIPMENT

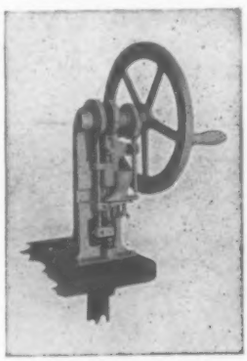
Above installation includes several types of equipment designed for high vacuum research purposes and semi-plant scale operations . . . Rotary Dryer; Rotating Dryer for crystals, metallic powders and other materials that can be tumbled; Pan Dryers; Shelf Dryers; High Vacuum Pump and Condenser, etc.



HIGH VACUUM GAGES

Indicating and Recording

New, portable, McLeod type gages. Particularly suited for making quick readings (in 2 to 5 seconds only) within the micron range at any point in the laboratory. These are simple, rugged instruments. Mercury can't spill. Practically unbreakable. Built-in condensable vapor trap. Other improved features. Four models, ranges 0-700 and 0-5000 microns. Also Vacorder recording type gages. Bulletin 45-G.

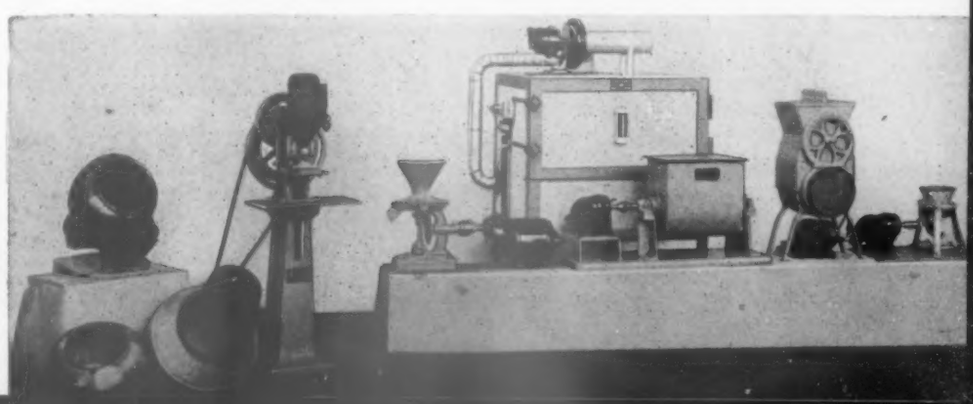


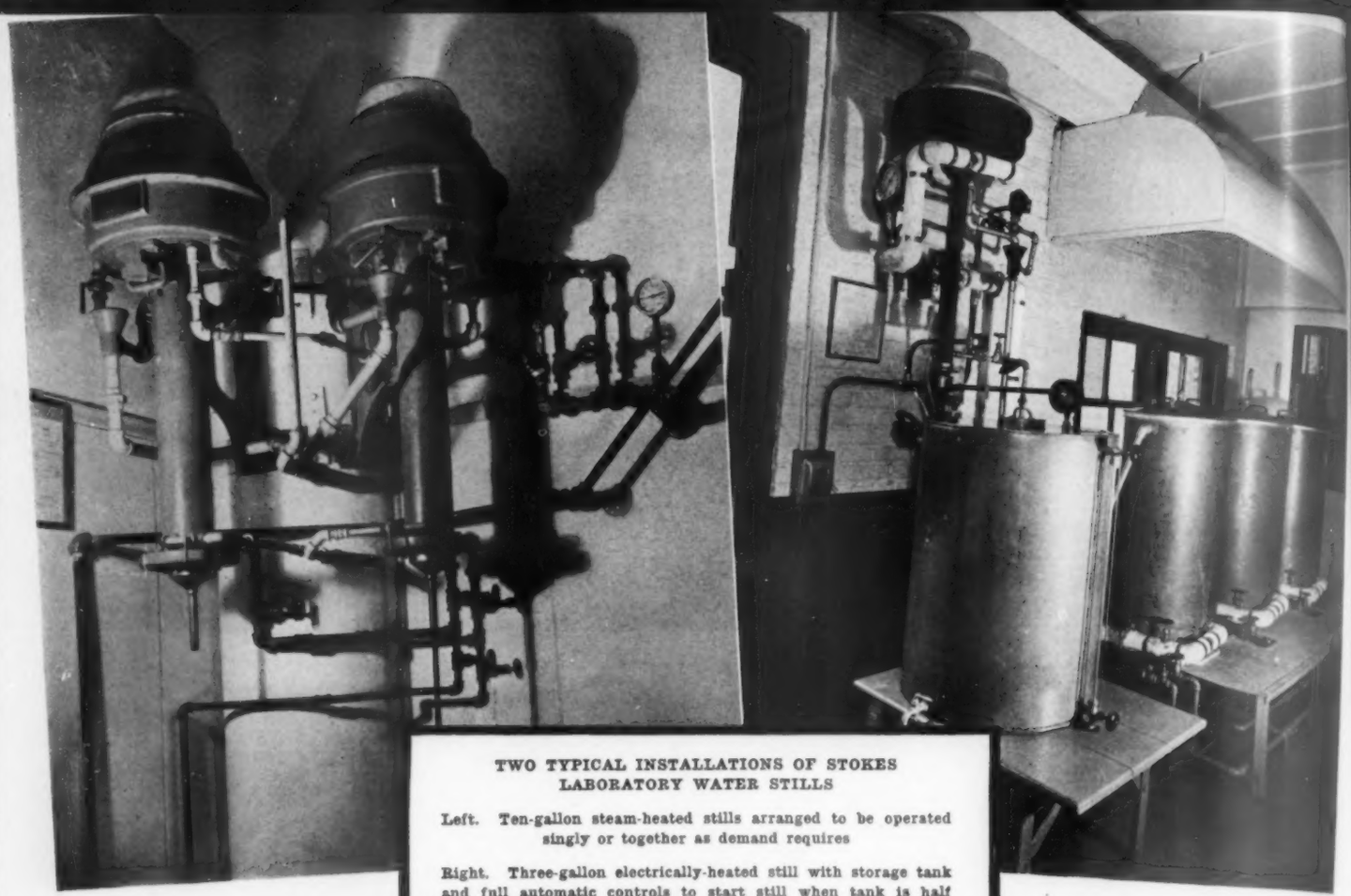
TABLET MACHINES FOR CHEMICAL AND METALLURGICAL RESEARCH

This popular laboratory model "Eureka" Tablet Machine is widely used for research purposes, compressing chemicals, making experimental batches of catalytic tablets (that pack uniformly and expose large reaction surfaces) tabletting pharmaceuticals, etc. It makes tablets up to ½" dia., at rates of 50 to 100 per min. More than 2000 in use. Hand-operated or motor-driven models. This machine is one of more than 20 stock models. Write for Catalog 41-T.

PHARMACEUTICAL LABORATORY EQUIPMENT

Equipment shown below is a portion of that installed by a college of pharmacy, to equip a complete semi-plant scale laboratory. Apparatus shown, left to right, motor-driven Coating and Polishing Pans, Tablet Compressing Machine, Drug Mill, electrically-heated Drying Closet, two types of Mixers and Ointment Mill. For specifications of this equipment get Catalog No. 42-T.





TWO TYPICAL INSTALLATIONS OF STOKES LABORATORY WATER STILLS

Left. Ten-gallon steam-heated stills arranged to be operated singly or together as demand requires

Right. Three-gallon electrically-heated still with storage tank and full automatic controls to start still when tank is half empty and to stop and flush out the still when the tank is filled

PURE WATER... A Laboratory Necessity

With a Stokes Water Still you can produce, dependably and economically, the chemically and bacteriologically pure distilled water required for all laboratory purposes . . . water of exceptional purity, well above strict U.S.P. requirements. (See typical analysis below.)

These stills are automatic in operation, simple, rugged and easy to clean. They operate on an efficient counter-current principle, the heat of the steam generated in the boiling chamber being utilized to preheat the raw feed water on its way to the boiling chamber. This method is very effective in making maximum use of the heat supplied to the still, thus reducing cost of operation to about ¼ cent per gallon for steam-heated models, 2 cents per gallon for gas and 4 cents (varying with the cost of current) when electrically-heated models are used.

Design and construction of these stills protect the purity of distillate by removing dissolved gases from the feed water, eliminating entrainment and continuously removing impurities that tend to accumulate in the boiling chambers. Stills can be equipped with complete automatic controls and are available either with or without storage tanks.

More than 20,000 Stoke Stills are in use the world over. Laboratory models are available through your own laboratory supply dealer. For sizes, specifications, etc., send for Catalog No. 41-S.



Electrically-heated laboratory still, ½ to 1½ g.p.h. capacity. These stills have an improved type heavy-duty heating element, fully protected against burn-out by a patented dual-purpose safety switch that cuts off the current, instantly, in case of over-heating from any cause.

***TYPICAL ANALYSIS OF DISTILLATE**

	Parts per 100,000
Total Solids as	
Volatile Solids	0.16
Inorganic Solids	0.12
Nitrogen as	
Free Ammonia	0.0035
Albuminoid Ammonia	0.0000
Nitrates	0.0000
Nitrites	0.0000
Chlorine	0.00
Bacteria per cc.	none

* Certified.

F. J. STOKES MACHINE COMPANY

5960 Tabor Road Olney P. O. Philadelphia 20, Pa.

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LEEDS & NORTHRUP COMPANY

Measuring Instruments — Automatic Controllers — Heat Treating Methods

Logan & Stenton Ave., Philadelphia 44, Pa.

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MEASURING INSTRUMENTS FOR RESEARCH, TEACHING AND TESTING

Adapted, with a high degree of exactness, to the latest needs of the research scientist, of the student and of the man who makes routine tests in laboratory, plant or field, is the wide variety of apparatus briefly listed in the following pages. Usually, there will be found a choice of instruments and their accessories: for high or moderate precision; for table use or portable; for general use or specialized. In some, all components are self-contained. Others are separate units which can be combined to form various assemblies. In all, we endeavor to embody sound measuring principles in constructions of genuine merit, to keep designs in advance of demands for operating convenience, to use suitable materials assembled by skilled craftsmen.

Almost invariably, adjustments of L&N instruments prove better than our guarantees. Realizing that nothing is permanent and that the best of standards are not absolute, we make our claims conservatively. Our objective is so to proportion accuracy, sensitivity and readability in every instrument which bears the L&N insignia, and to build it so well, that its owner can have complete confidence in every measurement made within error limits which are definitely specified. This is an objective which our executives and workers have joined in holding conspicuously before them for over forty years . . . during which the extensive and ever-widening contacts we have had with both science and industry have helped us to advance progressively in the art of instrument making. In recent years, the application of scientific principles to an extensive line of instruments adapted to the more rugged conditions of industry, has enabled us to equip, staff and qualify more thoroughly than ever to carry forward the fundamental instrument arts in step with the growing demands of science.

INDUSTRIAL-TYPE EQUIPMENTS SOLVE MANY LABORATORY PROBLEMS

Industrial-type instruments and furnaces (not listed here) have many uses in the laboratory. Micromax recorders calibrated to read directly in temperature, pH or other units provide continuous chart records of test runs. (See brief description bottom of page 506.) Industrial-type indicators, especially portable models, are often used for a variety of measurements; optical pyrometers, for high temperatures. In metallurgical laboratories, the smaller sizes of Hump and Homo electric heat-treating furnaces are used for hardening, carburizing, nitriding, tempering and annealing.

RESISTORS · INDUCTORS · CAPACITORS · STANDARD CELLS

For use as reference or working standards in d-c and a-c bridge measurements, we offer a wide choice of fixed and adjustable standards—resistors, inductors, capacitors—and standard (potential) cells. Usually, you will find listed the ones needed to cover any desired range.

Each L&N standard is a convenient unit which can be depended upon to retain its stated precision. Because the properties of resistance materials, dielectrics, etc., are not invariable, and even the best standards are not absolute, a margin is allowed between accuracy of adjustment and that guaranteed. To assure reliability, only that accuracy is claimed which a given standard can be expected to maintain, in normal use, for a long period.

RESISTORS: You'll find both fixed resistors and adjustable resistance boxes—some primarily for direct current, others specially designed for alternating current. Many are available in a choice of resistance values.

INDUCTORS: For use as standards of inductance in a-c bridge measurements up to 1000 cycles, we list on pages 494 and 495 a choice of fixed and adjustable inductors.

The fixed inductors listed are toroidal coils, mounted on bakelite plates, enclosed in ventilated cases. Up to 1000 cycles, these inductors are practically immune from stray-field errors, cause no objectionable external fields, and show no appreciable increase in resistance.

For varying self inductance of a circuit, or mutual inductance between two circuits, we list Brooks Inductometers. Standard instruments have self-inductance scales only.

CAPACITORS: Both mica and air capacitors are available in a choice of fixed and adjustable models. Due to improved mechanical switching arrangements, both air and mica capacitors suitable for use at carrier frequencies are available, and two of the air capacitors listed (1187 and 1188) can be used at frequencies of a few megacycles.

STANDARD (POTENTIAL) CELLS: Here listed are the standard cells we recommend for use with Potentiometers (page 496) which require an external cell.

For measurements at either high or moderate precision, we recommend the 7308 Eppley Standard Cell for use with the several null potentiometers listed; the 7309 Low Resistance Cell, for use with Brooks Deflection Potentiometers. Each is supplied with a certificate issued by the Eppley Laboratories. The 7310 Cell should be used only for work where relatively low precision is acceptable.



4210
(about ⅛ actual size)



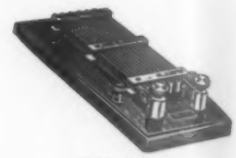
4020, 25, 30, 35, 40
(about ⅐ actual size)



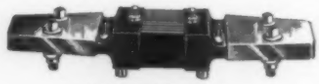
4221, 4222 is similar
(about ⅛ actual size)



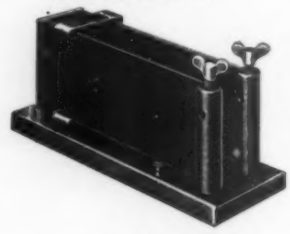
4223
(about ⅛ actual size)



4360, 4361
(about ⅙ actual size)



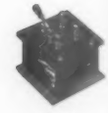
4369, 4372, 4375
(about 1/12 actual size)



4363
(about 1/12 actual size)



4205–09
(about ⅕ actual size)

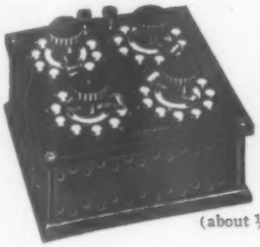


4245
(about 1/24 actual size)

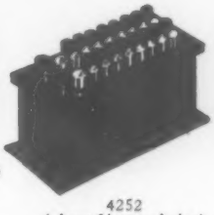
FIXED D-C RESISTORS

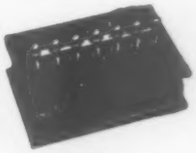
Instrument	List Number	Resistance, Ohms	Current Rating, Amperes	Limit of Error	Refer to Catalog
One-Ohm Standard Resistor (A primary standard of resistance which establishes a new order of stability)	4210	1 Nominal	0.1	N.B.S. Certificate required giving value ±0.0001% in terms of ohm maintained by National Bureau of Standards.	E-53 E
National Bureau of Standards Type Resistors (For use as primary standards of resistance)	4020	1	0.3	±0.01%	E-53 E
			1	±0.04%	
	4025	10	0.1	±0.01%	
			0.3	±0.04%	
	4030	100	0.03	±0.01%	
			0.1	±0.04%	
	4035	1000	0.01	±0.01%	
			0.03	±0.04%	
	4040	10,000	0.003	±0.01%	
			0.01	±0.04%	
Reichsanstalt Type Resistors (For use in accurate measurement of current with a potentiometer, and as standards of comparison in low-resistance measurements)	4221	0.1	3*	±0.02%	E-53 E
			10*	±0.05%	
	4222	0.01	10*	±0.02%	
			30*	±0.05%	
	4223	0.001	30*	±0.02%	
			100*	±0.05%	
Resistors (Shunts) for Large Currents (Primarily for accurate measurement of large currents with potentiometers, and as standards for comparison in low-resistance measurements)	4360	0.1	15	±0.04% when cooled by air at ordinary room temperature.	E-53 E
	4361	0.01	100		
	4363	0.001	300		
	4364	0.001	500		
	4369	0.00004	1500		
	4372	0.00002	2000		
	4375	0.00001	3000		
Secondary Resistance Standards (Working standard of moderate accuracy)	4205	1	1.0	±0.1%	E-53 E
	4206	10	0.3		
	4207	100	0.1		
	4208	1000	0.03		
	4209	10,000	0.01		
Tenth-Megohm Resistance Box (A high-resistance standard with short-circuiting switch)	4245	100,000	0.007	±0.1%	E-53 E

* Maximum current assumes operation in stirred oil bath.

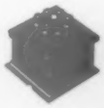

4716
(about ⅛ actual size)


4775–76
(about ⅛ actual size)


4252
(about ⅛ actual size)


4244
(about 1/12 actual size)


4246
(about 1/16 actual size)


4247
(about 1/16 actual size)


4640
(about ⅛ actual size)

ADJUSTABLE D-C RESISTORS

Instrument	List Number	Resistance, Ohms	Decade Steps	Current Rating, Amperes		Limit of Error	Refer to Catalog
Open-Dial-Switch Resistance Boxes (For d-c measurements. Combine high precision, speed and convenience)	4710	100	10x0.1+9(1+10)	When Highest Decade in Use is	Current	Resistance change from zero setting, measured across binding posts, equals dial settings ±(0.05%+0.005Ω).*	E-53 E
	4711	1000	10x1+9(10+100)				
	4712	10,000	10x10+9(100+1000)	0.1	2.2		
	4715	1000	10x0.1+9(1+10+100)	1.0	0.7		
	4716	10,000	10x1+9(10+100+1000)	10.0	0.22		
	4720	10,000	10x0.1+9(1+10+100+1000)	100.0 1000.0	0.07 0.022		
Enclosed-Switch Resistance Boxes (Popular, inexpensive standards of moderate precision. Suitable for d-c and up to 100 cycles a-c)	4770	99	9(1+10)	When Highest Decade in Use is	Current	Resistance change from zero setting, measured across binding posts, equals dial settings ±(0.1%+0.01Ω).*	E-53 E
	4771	990	9(10+100)				
	4772	9900	9(100+1000)	0.1	1.6		
	4773	999	9(1+10+100)	1.0	0.5		
	4774	9990	9(10+100+1000)	10.0	0.16		
	4775	9999	9(1+10+100+1000)	100.0	0.05		
	4776	999.9	9(0.1+1+10+100)	1000.0	0.016		
Post-Office Pattern Resistance Box (Popular for instruction)	4252	11,110	Resistors: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000, 4000Ω.	Equals $\sqrt{1/R}$ where R is highest value resistor in use.		Resistance change from zero setting, measured across binding posts, equals plug readings ±(0.1%+0.01Ω).*	E-53 E
Post-Office Pattern Resistance Box (Similar to 4252, but lower total resistance)	4254	1110	Resistors: 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400Ω.	Equals $\sqrt{1/R}$ where R is highest value resistor in use.		Resistance change from zero setting, measured across binding posts, equals plug readings ±(0.1%+0.01Ω).*	E-53 E
Megohm Resistance Box (A high-resistance standard in 6 sections which can be used independently or in different combinations)	4244	1,000,000	Subdivided 4 x 200,000 + 2 x 100,000Ω.	0.002		±0.1%	E-53 E
Tenth-Megohm Resistance Box (A high-resistance standard in 4 sections which can be used independently or in different combinations)	4246	100,000	Subdivided: 10,000 + 20,000 + 30,000 + 40,000Ω.	0.003		±0.1%	E-53 E
Tenth-Megohm Resistance Box (Similar to 4246, but terminals of sections connected to binding posts on insulating pillars on top plate, and links used for connection between posts)	4247	100,000	Subdivided: 10,000 + 20,000 + 30,000 + 40,000Ω.	0.003		±0.1%	E-53 E

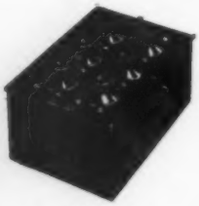
* Statement assumes that box has been in regular use, or that dials will be rotated or plugs twisted in their blocks before box is put in use after a period of idleness. D-C resistance, with all dials or plugs at zero, does not exceed 0.03Ω.

FIXED A-C RESISTORS

Instrument	List Number	D-C Resistance, Ohms	Reactive Component	Current Rating, Amperes	Limit of Error	Refer to Catalog
Secondary-Standard A-C Resistors (Working standards for a-c measurements)	4631	1000	1 μh for 1000Ω standard to 2.5 μμf for 20,000Ω standard. Change of residual, less than 5% for frequencies up to 50 kc.	0.31	In d-c resistance: ±0.1%. Difference between a-c and d-c resistance less than ±0.001% at 1 kc, ± 0.01 % up to 50 kc.	E-53 E
	4632	2000		0.22		
	4633	3000		0.18		
	4634	4000		0.16		
	4640	10,000		0.01		
	4642	20,000		0.007		



4764–65
(about 1/16 actual size)



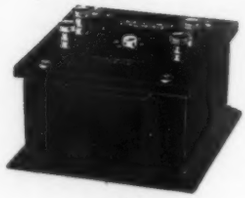
4749–50
(about 1/16 actual size)



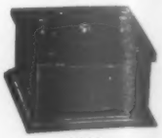
4747–48
(about 1/16 actual size)



4745–46
(about 1/12 actual size)



1540
(about 1/8 actual size)



1530
(about 1/8 actual size)

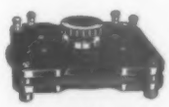
ADJUSTABLE A-C RESISTORS

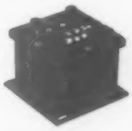
Instrument	List Number	Total Resistance, Ohms	Decade Steps*	Maximum Change of Inductance (or Capacitance) When Setting of Indicated Decade is Changed: 0.01 Ohm Decade μh	0.1 Ohm Decade μh	1.0 Ohm Decade μh	10 Ohm Decade μh	100 Ohm Decade μh	1000 Ohm Decade μμf	Inductance for Zero Setting μh	Capacitance for 10,000 Ohm Setting μμf	Current Rating, Amperes	Limit of Error D-C Resistance Change Across Binding Posts Equals the Reading of the Dials:	Refer to Catalog
A-C Resistance Boxes (Adjustable standards of sturdy permanent construction for precise measurements with a-c bridges. 4765 and 4764 for very low; others for moderately low inductance and capacitance changes)	4764 Shielded	11,111.1	10(0.01+0.1+1+10+100+1000)	0.003	0.006	0.02	0.5	15.0	5.0	1.5	10.0	Equals $\frac{0.5}{\sqrt{R}}$ where R is highest setting of highest decade in use.	±(0.05% +0.005 ohm)**	E-53 E
	4765 Shielded	11,111.1	10(0.01+0.1+1+10+100+1000)	0.01	0.02	0.05	0.5	15.0	5.0	1.5	10.0		±(0.05% +0.005 ohm)**	
	4750 Shielded	11,111.1	10(0.01+0.1+1+10+100+1000)	0.02	0.2	0.5	1.0	25.0	7.0	0.7	15.0	When Highest Decade in Use is: 0.01, 0.1, 1, 10, 100, 1000 — Current: 5, 1.6, 0.5, 0.11, 0.035, 0.011	±(0.05% +0.005 ohm)**	
	4749 Shielded	11,111.1	10(0.01+0.1+1+10+100+1000)	0.02	0.2	0.5	1.0	25.0	7.0	0.7	15.0	0.01, 0.1, 1, 10, 100, 1000 — 5, 1.6, 0.5, 0.15, 0.05, 0.015	±(0.1% +0.01 ohm)**	E-53 E
	4748 Shielded	11,110	10(1+10+100+1000)	Lowest dial 1 ohm		0.5	1.0	25.0	7.0	0.4	15.0	Same as 4750	±(0.05% +0.005 ohm)**	
	4747 Shielded	11,110	10(1+10+100+1000)	Lowest dial 1 ohm		0.5	1.0	25.0	7.0	0.4	15.0	Same as 4749	±(0.1% +0.01 ohm)**	
	4746 Unshielded	11,110	10(1+10+100+1000)	Lowest dial 1 ohm		0.5	1.0	10.0	5.0	0.4	10.0	Same as 4750	±(0.05% +0.005 ohm)**	
	4745 Unshielded	11,110	10(1+10+100+1000)	Lowest dial 1 ohm		0.5	1.0	10.0	5.0	0.4	10.0	Same as 4749	±(0.1% +0.01 ohm)**	

* In 4745-4750 the lowest decade may be removed and a 10,000 ohm decade incorporated at an additional charge.
** Statements of d-c resistance change assume that boxes have been in regular use, or that dials will be rotated before a box is put in use after a period of idleness. D-C resistance, with all dials at zero, does not exceed: 0.03 ohm for 4745 to 4749 inclusive, and for 4764 and 4765; 0.04 ohm for 4749 and 4750.

FIXED INDUCTORS

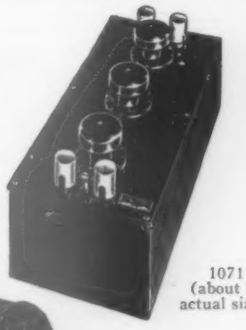
Instrument	List Number	Inductance, Millihenrys	Continuous Current Capacity, Amperes	Limits of Error at Frequency of 1000 Cycles:	Time Constant Approximate $\left(\frac{L}{R}\right)$	Refer to Catalog
Standards of Self Inductance (Fixed Inductor)	1530	1	1	±1%	1×10^{-3}	E
	1531	10	0.5	±0.2%	1×10^{-2}	
	1532	100	0.15	±0.2%	1×10^{-2}	
	1533	1000	0.05	±0.2%	1×10^{-2}	
Standard of Mutual Inductance (Fixed Inductor)	1540	50	0.15	±0.5%	5×10^{-4}	E


1520
(about 1/12 actual size)


1056
(about 1/16 actual size)


1061
(about 1/16 actual size)

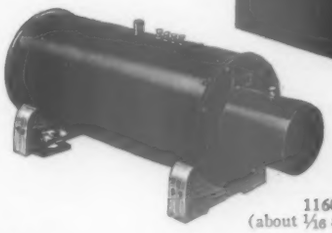

1058
(about 1/16 actual size)


1071
(about 1/8 actual size)


1070
(about 1/12 actual size)


1188
(about 1/12 actual size)


1185
(about 1/12 actual size)


1160–61
(about 1/16 actual size)

ADJUSTABLE INDUCTORS

Instrument	List Number	Inductance, Millihenrys	Continuous Current Capacity, Amperes	Limits of Error at Frequency of 1000 Cycles	Time Constant Approximate $\left(\frac{L}{R}\right)$	Refer to Catalog
Brooks Inductometer (Adjustable, self-inductance range)	1520-A	1.5 to 12	1	±0.3%	2×10^{-3}	E
	1520-B	12 to 100	0.35	±0.3%	2×10^{-3}	
	1520-C	100 to 800	0.1	±0.3%	2×10^{-3}	
	1520-D	0.8 to 6 henrys	0.03	±0.9% Calibrated at 60 cycles only	2×10^{-3}	
	1520-X	Special Range				

CAPACITORS

Instrument	List Number	Capacitance	Decade Steps	Limits of Error	Refer to Catalog
Fixed Mica Capacitor (For high precision)	1056	0.5 μf.*		±0.25%	E
Adjustable Mica Capacitor (For high precision)	1061	1 μf in eight sections.*	0.5, 0.2, 0.1, 0.1, 0.05, 0.02, 0.02, 0.01 μf.	±0.25% in each section.	E
Adjustable Mica Capacitor (For high precision)	1058	1 μf in five sections.*	0.5, 0.2, 0.2, 0.05, 0.05 μf.	±0.25% in each section.	E
Three-Dial Shielded Mica Capacitor (Precision type for measurements at higher frequencies)	1071	1.11 μf.*	10(0.001 + 0.01 + 0.1)	Measured from binding posts, at 1000 cycles, capacitance difference between each setting of each dial and its zero setting (other dials on zero) agrees with nominal value of that setting to ±(0.1% + 0.5 μμf.)	E
Three-Dial Mica Capacitor (For moderate precision)	1070	1 μf.*	9(0.001 + 0.01 + 0.1). Extra 0.001 μf unit controlled by knife switch.	Same as 1071, except to ±(0.25% +15 μμf).	E
Adjustable Two-Terminal Air Capacitor (For high-precision measurements of low capacitance. Quartz insulators)	1188	Minimum 50 μμf. Maximum 1300 μμf.	Calibration based on zero setting of 100 μμf. 12 × 100 + continuously adjustable dial −50 to +100 μμf.	±1 μμf.	E
Adjustable Two-Terminal Air Capacitor (Similar to 1188 except has isolantite insulators)	1187	Minimum 50 μμf. Maximum 1300 μμf.	Calibrations based on zero setting of 100 μμf. 12 × 100 + continuously adjustable dial −50 to +100 μμf.	±1 μμf.	E
Adjustable Air Capacitor (Without L&N calibration data. For ordinary capacitance measurements)	1185	Range 40 to 1100 μμf.	Scale 0 to 100 uniform divisions.		E
Adjustable Air Capacitor (With L&N calibration data giving capacitance at each 10 divisions. For ordinary capacitance measurements)	1185-A	Range 40 to 1100 μμf.	Scale 0 to 100 uniform divisions.	±5 μμf.	E
Adjustable Air Capacitor (For balancing out residual capacitance in bridge assemblies)	1181	Range approximately 8 to 120 μμf.	Not calibrated.		E
Adjustable Air Capacitor (Similar to 1181 except for range)	1183	Range approximately 18 to 500 μμf.	Not calibrated.		E

*All mica capacitors may be operated continuously on 350 volts rms, 60 cycles.

CAPACITORS (Cont'd.)

Instrument	List Number	Maximum Potential Rating	Nominal Value	Limits of Error	Refer to Catalog
Cylindrical-Type Shielded Fixed Air Capacitors	1160	10,000 volts at 60 cycles.	100 $\mu\mu$f approximate.	Actual capacitance, to within ±0.2% of the value engraved on nameplate.	E
	1161	25,000 volts at 60 cycles.	100 $\mu\mu$f approximate.		E

STANDARD CELLS

Instrument	List Number	Internal Resistance	EMF at 20 C	Limits of Error	Refer to Catalog
Unsaturated Standard Cells	7308	Not over 500 ohms.	1.0185 to 1.0194 volts.	±0.01% of certified value.	E
	7309	Not over 100 ohms.	1.0185 to 1.0194 volts.	±0.01% of certified value.	E
	7310	Not over 500 ohms.	1.018 volts.	±0.1% at 20 C.	E

GALVANOMETERS AND DYNAMOMETERS

Briefly presented here is the L&N line of galvanometers and dynamometers—d-c galvanometers, both moving-coil and moving-magnet types; a-c galvanometers; astatic dynamometers.

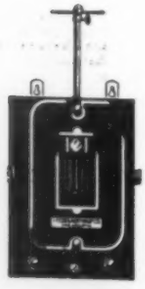
Practically the entire range of applications for galvanometers and dynamometers is covered by the standard instruments we list. Among them, you can almost always find the one you need for use as a balance-point detector in potentiometer or bridge measurements, or for calibrated deflection measurements. Usually, the system is an easily interchangeable unit, so that one galvanometer with extra systems can be made to serve for a wide range of measurements. Galvanometers having characteristics other than those specified herein, can be supplied. State characteristics you desire—such as period, sensitivity, critical damping resistance—in the order of their importance. In most cases, special characteristics can be obtained with standard parts, and the cost of the instrument will be little more than for listed galvanometers of the same type.

If you wish a more complete discussion of galvanometer characteristics and an explanation of fundamental principles underlying the construction and use of these instruments, we will gladly send you, on request, a copy of our 48-page, pocket-size Note Book ED(1) *Notes on Moving-Coil Galvanometers.*

D-C MOVING COIL GALVANOMETERS



2285 shown
2290, 2284, 2500,
2255 are similar
(about ⅙ actual size)



2239
(about 1/10 actual size)



2420
(about ⅛ actual size)

Instrument	List Number	Sensitivity* (Per mm at 1 meter or per scale Division)	Period (Sec.)	Resistance (Ohms)		Refer to Catalog
				External Critical Damping	System	
Type HS Reflecting Galvanometer (For extra high current sensitivity)	2290	0.00001 μa	40	100,000	800	ED
Type HS Reflecting Galvanometer (Extra high voltage sensitivity)	2284-a	0.5 μv	1.5	40	21	ED
	2284-b	0.05 μv	7	10	16	ED
	2284-c	0.1 μv	5	20	16	ED
	2284-d	0.1 μv	5	30	25	ED
	2284-e	0.005 μa	1.5	1200	300	ED
	2284-x	(as specified)	—	—	—	ED
Type HS Reflecting Galvanometer (Very high sensitivity)	2285-c	0.1 μv	7.5	25	17	ED
	2285-b	0.2 μv	5	40	16	ED
	2285-f	0.00004 μa	20	70,000	800	ED
	2285-g	0.0003 μa	7	10,000	525	ED
	2285-h	0.008 μa	1.5	2,500	515	ED
	2285-x	(as specified)	—	—	—	ED
Type R Reflecting Galvanometer (For high sensitivity in general use)	2500-a	0.5 μv	5	50	12	ED
	2500-b	0.0005 μa	6	10,000	500	ED
	2500-c	0.005 μa	5	300	40	ED
	2500-e	0.003 μa	3	2,200	500	ED
	2500-f	0.0001 μa	14	22,000	500	ED
	2500-g	0.0005 μa	6	7,000	500	ED
Type P Galvanometer (For moderate sensitivity in general use. Widely used in educational laboratories. Easy to mount and handle)	2239-a	0.014 μa	8	10,000 to 100,000	115	ED
	2239-b	0.001 μa	14	10,000 to 25,000	1,000	ED
	2239-f	0.0002 μa	18	46,000	8,000	ED
	2239-c	1.5 μv	12	165	35	ED
Galvanometer with Enclosed Lamp and Scale (For moderately high sensitivity)	2420-a	0.04 μa	3	10,000	300	ED
	2420-d	0.04 μa	3	2,000	300	ED
	2420-b	25.0 μv	3	80	26	ED
	2420-c	0.025 μa	3	15,000	1,000	ED
Marine Galvanometer (For high sensitivity in use on shipboard)	2255	0.02 μa	2	100,000	270	ED

* Sensitivities are at least as high as stated; other characteristics within 20%. Microvolt sensitivities are for critical damping resistance in series. Resistances include suspensions.

GALVANOMETERS (Cont'd.)

Instrument	List Number	Sensitivity* (Per mm at 1 meter or per scale Division)	Period (Sec.)	Resistance (Ohms)		Refer to Catalog
				External Critical Damping	System	
Pointer Galvanometer—45 degree scale (Combines sensitivity and convenience)	2310-a	2 μa	2.5	20	12	ED
	2310-e	1 μa	4.5	30	16	ED
	2310-b	1 μa	3	110	25	ED
	2310-c	0.25 μa	3	1,800	250	ED
	2310-d	0.125 μa	3.5	10,000	1,000	ED
Pointer Galvanometer — Horizontal Scale (General-purpose galvanometer in its simplest form)	2320-b	4 μa	3	50	20	ED
	2320-c	1 μa	3	950	250	ED
	2320-d	0.5 μa	3	2,400	1,000	ED
Portable Galvanometer—Horizontal Scale (Same as 2320, but for field use)	2322-b	4 μa	3	50	20	ED
	2322-c	1 μa	3	950	250	ED
	2322-d	0.5 μa	3	2,400	1,000	ED
Pointer Galvanometer—Vertical Scale (Similar to 2320, but has vertical scale)	2330-b	4 μa	3	50	20	ED
	2330-c	1 μa	3	950	250	ED
	2330-d	0.5 μa	3	2,400	1,000	ED
Ballistic Galvanometer (Specially designed for ballistic use)	2239-d	0.002 μq	26	10,000	2,000	ED
	2239-e	0.011 μq	24	230	60	ED
	2285-d	0.0003 μq	27	40,000	700	ED
	2285-e	0.003 μq	25	500	12	ED

* Sensitivities are at least as high as stated; other characteristics within 20%. Microvolt sensitivities are for critical damping resistance in series. Resistances include suspensions.



2310
(about ½ actual size)



2320
(about ⅛ actual size)



2330
(about ¼ actual size)



2322
(about ⅛ actual size)

D-C MOVING MAGNET GALVANOMETER

Instrument	List Number	Sensitivity (Per mm at 1 meter)*	Period (Sec.)	Resistance of Fixed Coils (Ohms)	Refer to Catalog
Coblentz Galvanometer (Primarily for use with thermopiles, in measuring minute quantities of radiant energy. More sensitive than moving-coil galvanometers. Has four fixed field coils which can be connected in three different electrical arrangements)	2270	Series 0.0002 μa 0.008 μv	8 (Approx.)	40	ED
		Series-Parallel 0.0004 μa 0.004 μv	8 (Approx.)	10	
		Parallel 0.0008 μa 0.002 μv	8 (Approx.)	2.5	

* Sensitivity at least as high as stated; other characteristics within 20%. Voltage sensitivities are at galvanometer terminals, and will be proportionately reduced as total circuit resistance is increased. No damping resistance is stated; for practical purposes, damping is unaffected by changes in external circuit resistance.



2270
(about ⅛ actual size)

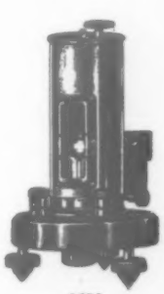


2380
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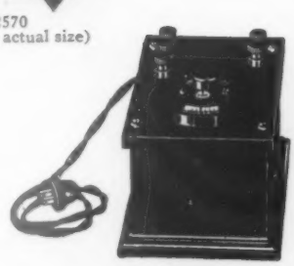
A-C MOVING COIL GALVANOMETERS

Instrument	List Number	Sensitivity (Per mm at 1 meter or per scale Division)*	Period (Sec.)	System Resistance (Ohms)	Refer to Catalog
High Sensitivity A-C Reflecting Galvanometer (For high sensitivity in 60-cycle bridge measurements)	2570	0.0035 μa	10	18	ED
A-C Pointer Galvanometer (General-purpose a-c galvanometer in its simplest form)	2370-a	5 μa	2.6	20	ED
	2370-c	1 μa	2.6	250	
	2370-d	0.5 μa	2.6	1,000	
A-C Detector (Primarily for use with impedance bridges)	2380	0.05 μa	3	500	E ED

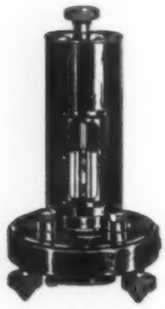
*Sensitivities at least as high as stated; other characteristics within 20%. Sensitivities stated assume that current in moving coil is in phase with current in field coil. Resistances include suspensions.



2570
(about ⅛ actual size)



2370
(about ⅛ actual size)



2350
(about 1/6 actual size)



2440
(about 1/10 actual size)



2450
(about 1/10 actual size)



2460
(about 1/7 actual size)

A-C VIBRATION GALVANOMETERS

Instrument	List Number	Sensitivity (Per mm at 1 meter)*		Resonance Range, Per Cent		Resistance (Ohms)	Refer to Catalog
		60 Cycles	3rd Harmonic	Current	Emf		
Vibration Galvanometer (For a-c measurements at commercial frequencies)	2350-a	0.025 μa 500.0 μv	111 μa	0.3	1.5	800.0	ED
	2350-b	5.0 μa 2.0 μv	5,000 μv	0.3	0.7	0.35	ED
Vibration Galvanometer (Similar to 2350, but equipped with remote tuning device)	2351-a	0.025 μa 500.0 μv	111 μa	0.3	1.5	800.0	ED
	2351-b	5.0 μa 2.0 μv	5,000 μv	0.3	0.7	0.35	ED

* Sensitivities at least as high as stated; other characteristics within 20%.

ASTATIC DYNAMOMETERS

Instrument	List Number	Watt Sensitivity (microwatts)	Current Sensitivity (microamperes)*	Period (seconds)	Circuit	Total Resistance (ohms)	Total Inductance (millihenrys)	Continuous Current Rating (amperes)	Refer to Catalog
High-Sensitivity Astatic Dynamometer (For dielectric-loss and other watt-dynamometer measurements)	2440	5	0.05	10	Moving Coils Fixed Coils	200 125	15 110	0.05 0.1	ED
Astatic Dynamometer (For moderate sensitivity in educational and other laboratories)	2450	50	0.5	8	Moving Coils Fixed Coils	35 25	0.5 12	0.1 0.1	ED
Astatic Dynamometer with Enclosed Lamp and Scale (For many uses, including that of a null detector in measuring power factor of full-reel lengths of high-voltage cable)	2460	300	3	3.6	Moving Coils Fixed Coils	200 20	3.3 3.3	0.03 0.1	ED

* Sensitivities at least as high as stated; other characteristics within 20%. Sensitivities (per mm at 1 meter for 2440 and 2450; per mm division for 2460) are with fixed coil circuit separately excited and carrying full current. Watt sensitivity assumes sufficient external resistance for 110 volts, that is, total resistance 1,100 ohms. On special order, we can provide dynamometers built to specifications other than those above.

THE ELECTRO-CHEMOGRAPH

For Quantitative and Qualitative Analysis by Determination of Current/Potential Relations

Any investigator with a problem in chemical analysis may wish to look into the possibilities of the dropping mercury electrode method . . . which permits quantitative as well as qualitative measurements, and is applicable to organic as well as inorganic analyses.

As made available in the L&N Electro-Chemograph, the dropping mercury electrode method is both accurate and rapid. Already installed in many university and industrial research laboratories, this versatile equipment is proving its usefulness in an ever-growing number of applications.

An assembly of standard L&N units, the equipment is reliable and accurate. Outstanding advantages of the L&N equipment include:

1. The operator sees the current/potential curve being inked. 2. The wide chart is easy to read, accurate and permanent. 3. Darkrooms, developing processes and delicate galvanometer systems are eliminated. 4. Instruments are made up of standard L&N mechanisms, proved reliable throughout years of use in other applications. Details in Bulletin E-94(1).

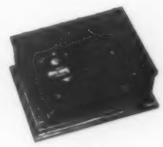

4230
(about 1/16 actual size)


4725
(about 1/16 actual size)


4760
(about 1/12 actual size)


4250
(about 1/12 actual size)


4282
(about 1/16 actual size)


4270
(about 1/10 actual size)

A-C AND D-C BRIDGES

For general measurements of resistance and impedance, and for a number of specific quantities which can be measured in terms of resistance or impedance, we build a varied line of d-c and of a-c bridges. For many applications, you'll find a suitable, standard model . . . either among those here listed for research, teaching and testing; or among our industrial-type indicators, recorders and controllers. For unusual problems, we can supply either a modified standard bridge or, if necessary, build a special one. Whether you have in mind a general or specific use, we are prepared to provide the precision you desire in a well-made, reasonably-priced bridge which will fit your needs satisfactorily.

For specific work in laboratory, plant or field you will find a wide choice of models: for high or moderate precision; for table use or portable; for general use or specialized. In some, all components are self-contained. Others comprise simply the bridge-arm elements. Still others are separate slidewires and ratio boxes which can be combined with other units to form various bridge assemblies.

In the design of these instruments, convenience and speed of manipulation have been given full consideration. Dials, plugs, keys and switches are easy to handle. Engraving and calibrated scales are legible. Binding posts for external connections are readily accessible. And, in building up this diversified line, we have made a real effort to keep the cost of each model consistent with its value to the user.

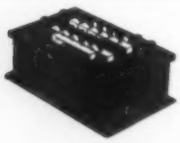
WHEATSTONE BRIDGES

Instrument	List Number	Ratio Arms	Rheostat	Limits of Error	Refer to Catalog
Anthony-Pattern Wheatstone Bridge (Highly precise standard for checking instruments and for general laboratory use)	4230	Double set of ratio resistors; two each of 1, 10, 100, 1000, 10,000Ω. Plug and block connectors.	Range 0 to 11,111Ω, adjustable in steps of 0.1Ω; five decades of ten resistors each, respectively, 0.1, 1, 10, 100, 1000Ω. Plug and block connectors.	In ratio resistors ±0.01%; of 0.1Ω rheostat resistors ±0.05%; of all others ±0.02%.	E-53
Open-Dial-Switch Wheatstone Bridge (Conveniently, rapidly used bridge of high precision for general use)	4725	Double set of ratio resistors; two each of 1, 10, 100, 1000, 10,000Ω. Plug and block connectors.	Range 0 to 10,000Ω, in steps of 0.1Ω; five decades $10 \times 0.1 + 9(1 + 10 + 100 + 1000)\Omega$. Open-dial switches.	In ratio resistors ±0.025%; in rheostat arm, resistance change from zero setting of dials equals ±(0.05% + 0.005Ω).	E-53
Enclosed-Switch Wheatstone Bridge (A compact, convenient bridge for moderate precision)	4760	Seven multiplying values: 0.001, 0.01, 0.1, 1, 10, 100, 1000Ω. Enclosed-dial switch.	Range 0 to 9,999Ω, in steps of 1Ω; four decades 9 (1 + 10 + 100 + 1000) Ω. Enclosed-dial switch.	In ratio resistors ±0.05%; in rheostat arm, resistance change from zero setting of dials equals ±(0.1% + 0.01Ω).	E-53 EN-95
Post-Office Pattern Wheatstone Bridge (For student instruction)	4250	Each has four resistors: 1, 10, 100, 1000Ω. Plug and block connectors.	Range 0 to 11,110Ω, in steps of 1Ω; 16 resistors, 1, 2, 3, 4, 10, 20, 30, 40, 100, 200, 300, 400, 1000, 2000, 3000, 4000Ω. Plug and block connectors.	In ratio resistors ±0.05%; in rheostat arm, resistance change from zero setting of dials equals ±(0.1% + 0.01Ω).	E-53
Wheatstone Bridge Ohmmeter (A portable, slidewire-ratio bridge for rapid routine tests)	4282	Slidewire, with 12-inch scale, calibrated 0 to infinity.	Five standard resistors, respectively, 1, 10, 100, 1000, 10,000Ω. Plug and block connectors.	In standard resistors ±0.1%; in resistance measurements ±1% between 0.3 and 30,000Ω.*	E-53
Per Cent Limit Bridge (For rapid inspection of resistors such as radio coils, magnetic windings, etc)	4270	Range 0 to ±15% for resistors of 1 to about 250,000Ω.	Uses standard comparison resistor.		E-53

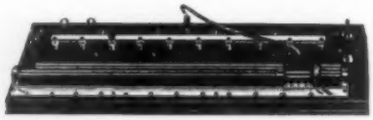
* Stated limits of error assume that the built-in standard will be selected which keeps the reading as near as possible to the center of the scale.

KELVIN BRIDGES

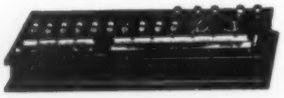
Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Refer to Catalog
Precision Kelvin Bridge (For precise measurements of low resistance. Consists of two units: 4320 Ratio Box, and 4300 Adjustable Standard Low Resistance)	4320 4300	Duplicate ratio arms, each including resistors of 100, 300, 400, 1000, 10,000Ω.	Nine fixed resistors each 0.001Ω and a 0.001Ω graduated bar having a scale of 110 divisions with vernier having 0.1 divisions.	0.01 μΩ to 1Ω.	Of bridge ±0.04% down to 0.0001Ω, of ratio resistors ±0.015%; of fixed resistors ±0.04%; of graduated bar ±0.2 division.	E-53



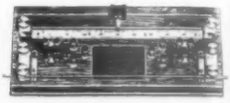
4320
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4300
(about 1/16 actual size)



4306
(about 1/16 actual size)



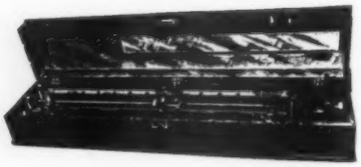
4340
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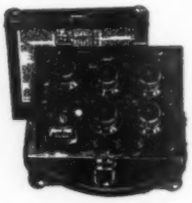
4285
(about 1/12 actual size)



4286
(about 1/12 actual size)



4870
(about 1/25 actual size)



5430–A
(about 1/9 actual size)



5300
(about 1/10 actual size)

KELVIN BRIDGES (Cont'd.)

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Refer to Catalog
General Purpose Kelvin Bridge (For moderate precision in low-resistance measurements)	4306	Seven settings: 0.1, 0.2, 0.5, 1, 2, 5, 10.	Nine fixed sections and a divided bar section each of 0.01Ω; scale has 100 divisions.	0.00001Ω to 1Ω.	In ratio resistors ±0.05%; of standard ±0.05%; of scale ±0.2 division.	E-53
Students' Kelvin Bridge (For teaching purposes)	4340	Three settings: 0.1, 1, 10.	Bar, total resistance 0.01Ω; scale has 100 divisions.	0.00001Ω to 0.1Ω.	In ratio resistors ±0.2%; of standard ±0.5%; of scale ±0.5 division.	E-53 E-53(1)
Portable Kelvin Bridge (For low-resistance measurements of moderate precision in testing electrical materials)	4285	Adjustable slidewires. Calibrated 1.5 to 2.66 and 1 to 1.6.	Dial switch. 0.0001, 0.0002, 0.0005, etc. up to 10Ω.	0.0001Ω to 25Ω.	±0.25% from 0.0005 to 26.6Ω; ±0.5% from 0.0001 to 0.0005Ω.	E-53
Kelvin Bridge Ohmmeter (A convenient portable bridge for low-resistance measurements in routine testing of windings, bars, rods, etc)	4286	Adjustable slidewire. Calibrated 0.01 to 0.11.	Plug switch. 0.01, 0.1, 1, 10, 100Ω.	0.0001 to 11Ω.	±2%.	E-53 EF22C
Hoopes Conductivity Bridge (For rapid routine comparison of wire and rod samples with standards of same material)	4870	Adjustable to compensate for weight of sample. Calibrated ±15%.	4872 Copper* Standard, calibrated according to International Annealed Copper Standard. Gauge Nos. 21, 18, 15, 12, 9, 6, 3 or 0, as specified, each for 3 consecutive gauge sizes.	0 to 105% of standard.	±0.2%.	E-53

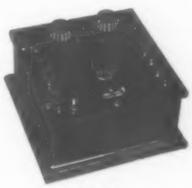
Aluminum standards can also be supplied.

FAULT LOCATING BRIDGES

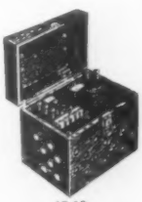
Instrument	List Number	Ratio Arms	Rheostat	Limits of Error	Refer to Catalog
Type U Test Set (A portable Wheatstone bridge especially adapted for locating faults in communication circuits)	5430-A	Multiplying values of 1/1000, 1/100, 1/10, 1/9, 1/4, 1/1, 10/1, 100/1 for resistance measurements and for Varley Loop tests; also settings of M1000, M100, M10 for ratios in Murray Loop tests. Enclosed-dial switch.	Four decades 10 (1+10+100) +9×1000Ω,+ infinity. Enclosed-dial switches.	In ratio resistors ±0.05%; in rheostat arm, resistance change from zero setting of dials equals dial readings ±(0.1%+0.01Ω).	E-53 E-53-441(1)
Type S Test Set (A portable Wheatstone bridge for ordinary resistance testing and for locating faults in communication circuits)	5300	Multiplying values of 0.001, 0.01, 0.1, 1, 10, 100, 1000 for resistance measurements and for Varley Loop tests; also settings of M1000, M100, M10 for ratios in Murray Loop tests. Enclosed-dial switch.	Four decades 9 (1+10+100+1000)Ω. Enclosed-dial switches.	In ratio resistors ±0.05%; in rheostat arm, resistance change from zero setting of dials equals dial readings ±(0.1%+0.01Ω).	E-53 E-53(3)
Power Cable Fault Bridge (For locating faults in power cables, at low voltages, by the Murray Loop method)	5365	Adjustable slidewire.	None.	Will carry normal test-current of 5 amps. continuously; 8 amps. for a short time.	E-53 E-53-441(4)



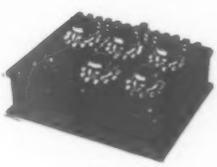
8069
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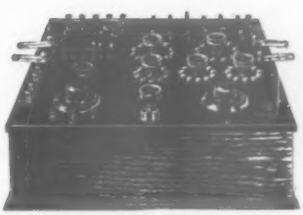
8063
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4960
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4666
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TEMPERATURE BRIDGES

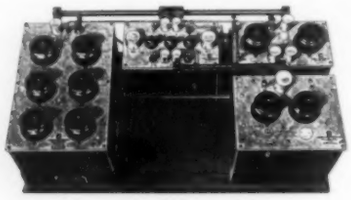
Instrument	List Number	Ratio Arms	Rheostat	Limits of Error	Refer to Catalog
Type G-2 Mueller Bridge (For extremely high-precision temperature measurements by the electrical resistance-thermometer method)	8069	Two ratio arms, 1000Ω each, adjustable to equality.	Range 0 to 111.111Ω in steps of 0.0001Ω. Three shunted decades giving steps of 0.0001, 0.001 and 0.01Ω; three decades of 0.1, 1 and 10Ω resistors. Principal shunted and decade resistors thermostatic to ±0.01 C near 35 C.	Resistance measurements within a few hundred thousandths of an Ω, or a few parts in a million, whichever is larger, provided a recently determined bridge calibration correction is applied.	E-33C (1)
Type G-1 Mueller Bridge (For precision temperature measurements by the electrical resistance-thermometer method)	8067	Ratio arms, 500Ω each, adjustable to equality.	Range 0 to 51.111Ω in steps of 0.0001Ω. Three shunted decades giving steps of 0.0001, 0.001, 0.01Ω; two decades at end of ratio arms of 0.1 and 1Ω resistors, and binding posts on end of rheostat for connection to 0, 10, 20, 25, 25.5, 30 or 40Ω resistors.	±0.02% or ±0.0001Ω, whichever is greater.	E-33C (1)
Resistance-Thermometer Bridge (For moderate-precision temperature measurements by the electrical resistance-thermometer method)	8063	Ratio arms, 130Ω nominal.	Range 0 to 200.1Ω. Two dial decades 9(1+10)Ω, and a 100Ω resistor removable by short-circuiting link, plus adjustable slidewire of 1.1Ω.	±0.005Ω up to 10Ω, ±0.05% above 10Ω.	E
Portable Temperature Bridge (Similar to 8063, but portable)	8062	Ratio arms, 130Ω nominal.	Same as 8063.	Same as 8063.	E
Portable Temperature Indicator (Primarily for body-temperature measurements, with 8153 Resistance Thermometer)	8016	Ratio 1 to 1.	Adjustable slidewire calibrated 90 to 110 F for 100Ω nickel thermometer.	Of indicator ±0.1 F.	E

CONDUCTIVITY BRIDGES

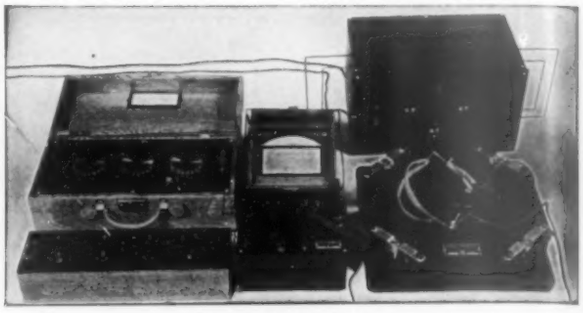
Instruments	List Number	Ratio Arms	Rheostat	Range	Limits of Error	Refer to Catalog
Jones Conductivity Bridge (A laboratory standard a-c bridge primarily for extremely precise measurements of electrolytic conductivity)	4666	Two 1000Ω resistors adjusted to equality of d-c resistance within ±0.01%. Slidewire between ratio resistors adjusts ratio arms to equality within ±0.0002% and provides range of ratio from 0.999 to 1.001.	See range. Capacitors included to balance residual.	60,000Ω in steps of 0.1Ω.	At 20 to 30 C and at relative humidity not over 70%, ±0.02%; with calibration corrections on resistors, above 100Ω, ±0.005% or better obtainable.	EN-95 E
Portable Electrolytic Resistance Indicator (For general use in measuring the resistance of electrolytic solutions. Operates at 115 volts, 60 or 25 cycles)	4960	Slidewire, direct reading in resistance.	Five standards: 1, 10, 100, 1000 and 10,000Ω.	0.3 to 30,000Ω.	±1% when built-in standards are selected to keep reading as near as possible to center of scale.	EN-95 E



9857
(about 1/16 actual size)



1554–A2
(about 1/20 actual size)



5337–A2; A1 is similar

CONDUCTIVITY BRIDGES (Cont'd.)

Instrument	List Number	Ratio Arms	Rheostat	Range	Limits of Error	Refer to Catalog
Portable Conductivity Resistivity Indicator (For general use in measuring the specific conductance and specific resistance of electrolytic solutions. Operates at 115 volts, 60 cycles)	4866	Slidewire, direct reading in conductivity and in resistivity.	Five standards: 38, 380, 3800, 38,000, 380,000Ω.	Specific conductance: 0.012 to 0.000,0001 mho per centimeter cube. Specific resistance: 80 to 10,000,000Ω per centimeter cube.	±0.3% of range.	EN-95 E
Portable Sugar Ash Indicator (For determining the ash content of raw sugars from the conductance of sugar solutions. Operates at 115 volts, 60 or 25 cycles)	4961	Slidewire, direct reading in conductivity.	Five standards: 2, 20, 200, 2000, 20,000Ω.	0.12 to 0.000,001 mho per centimeter cube. Corresponds to range 0.01 to more than 3% ash content of cane and beet sugar products.	±0.3% of range.	EN-95 E

FREQUENCY BRIDGES

Instrument	List Number	Ratio	Bridge Arms	Range	Limits of Error	Refer to Catalog
Portable Frequency Indicators (Double-range impedance bridges)	9857	Slidewire, direct reading in frequency.	Built-in mica capacitors and resistors.	58 to 62 and 24 to 25 cycles, for 115 volts.	±0.06 cycle at normal frequency; ±0.1 cycle at limits of range.	E
	9858	Same as 9857.	Same as 9857.	58 to 62 and 48 to 52 cycles, for 115 volts.	Same as 9857.	E

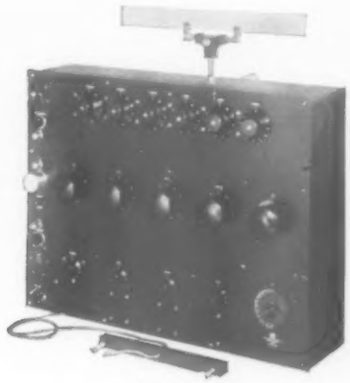
IMPEDANCE BRIDGES

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Refer to Catalog
Shielded Capacitance and Conductance Bridge Assembly (A high-precision bridge for determining power factor and related a-c characteristics of dielectrics up to 50 kilocycles)	1554-A2	1553 Shielded Ratio Box.	4764 Six-Dial Shielded Resistance Box; 1187 Adjustable Air Capacitor.	Of capacitance, 0-1300 $\mu\mu f$; of conductance, 0-300 μmhos.	Of capacitance ±1 $\mu\mu f$; of conductance, depends on value.	E
Shielded Capacitance and Conductance Bridge Assembly (Moderate precision)	1554-A1	Same as 1554-A2.	4750 Six-Dial Shielded Resistance Box; 1187 Adjustable Air Capacitor.	Same as 1554-A2.	Same as 1554-A2.	E
60-Cycle Owen Bridge Assembly (For determining permeability and core loss of magnetic core materials at inductions of 10 and 1,000 gausses at 60 cycles)*	5337-A1	1 fixed capacitor and 2 fixed resistors.	1070 Mica Capacitor. A 1 μf mica capacitor. 4745 Resistance Box.	Infinite.		E
1000-Cycle Owen Bridge Assembly (Similar to 5337-A1, but for tests at inductions of 10 gausses at 1000 cycles)*	5337-A2	Same as 5337-A1.	Same as 5337-A1.	Same as 5337-A1.		E

* A. S. T. M. A-34-38



1202
(about ⅛ actual size)



1511–A1–A2
(about 1/10 actual size)

IMPEDANCE BRIDGES (Cont'd.)

Instrument	List Number	Ratio Arms	Comparison Standard	Range	Limits of Error	Refer to Catalog
Schering Bridge Assembly (For measuring power factor and other dielectric characteristics of insulating materials. Maximum voltage 10 kv, 60 cycles)	1511-A1	Fixed standard high-voltage air capacitor for one, and test specimen for other.	Adjustable air capacitor [range, 10 (0.1 + 0.01 + 0.001 + 0.0001 μf) + 110 μμf] for power factor readings, and adjustable decade resistors [range, 10(0.1 + 1 + 10 + 100 + 1000Ω) + 0.105Ω] for capacitance readings.	Capacitance: 40 μμf to 0.02 μf using 100 μμf standard, 10 kv air capacitor. Power Factor: 0.0001 to 0.70.	Capacitance: ±0.25% exclusive of the error of the high-voltage air capacitor. Power Factor: ±0.000,005 for power factor of 0.0001 when capacitance of specimen is at least 100 μμf and applied voltage not less than 3000 volts. ±0.005 for power factor of 0.5.	E-54 (2) E
Schering Bridge Assembly (Similar to 1511-A1, but maximum voltage 25 kv, 60 cycles)	1511-A2	Same as 1511-A1.	Same as 1511-A1.	Same as 1511-A1.	Same as 1511-A1.	E-54 (2) E
Farad Bridge (For comparing capacitances with self-contained standard capacitors)	1202	Slidewire with 12-inch scale calibrated 0 to infinity.	Three standard mica capacitors, 0.001, 0.01 and 0.1 μf.	0.0003 to 1 μf.	Between 0.0003 and 0.003 μf, and between 0.3 and 1 μf, ±3%. Between 0.003 and 0.3 μf, ±1 to ±2%.*	E
Capacitance Limit Bridge (For rapid inspection of capacitors. Operates on 115 volts, 60 cycles)	1206	Adjustable top transformer reading in per cent deviation from comparison standard.	External comparison capacitor used, having capacity of 10 μf to 5 μμf. For which extra charge is made.	0 to ±30% of standard.		E

*Stated limits of error assume that the built-in standard will be selected which keeps the reading as near as possible to the center of the scale.

A-C AND D-C BRIDGE ACCESSORIES

SLIDEWIRES *

4258 **KOHLRAUSCH SLIDEWIRE.** About 15 feet long, in 10-turn helix, resistance about 7 ohms. Circular scale has 100 unit divisions; limit of error ± 0.25 unit div. Current rating, 0.5 ampere.

4261 **CIRCULAR SLIDEWIRE.** About 14 inches long, resistance about 100 ohms. Scale has 100 div.; limit of error ± 0.5 div. Current rating, 0.1 ampere.

4203 **STUDENTS' SLIDEWIRE.** A 16-inch wire of sturdy construction. Resistance about 30 ohms. Scale has 100 divisions; limit of error ± 1 division. Current rating, 0.2 ampere.

A-C RATIO BOX *

1553 **CAMPBELL - SHACKELTON SHIELDED RATIO BOX.** For a variety of impedance bridges. Comprises a pair of accurately matched 1000-ohm resistors, a shielded transformer and auxiliary resistors and capacitors for adjusting initial balance.

* Further information in Catalog E.

OSCILLATORS AND AMPLIFIERS *

9842 **VACUUM TUBE AUDIO FREQUENCY OSCILLATOR.** For 500, 1000 and 2000 cycles. Operates on 115 volts, 60 cycles.

9847 **TUNED AUDIO FREQUENCY AMPLIFIER.** For 500, 1000 and 2000 cycles. Operates on 115 volts, 60 cycles.

9846 **TUNED AUDIO FREQUENCY AMPLIFIER.** Same as 9847, but adapted for mounting on 19-inch telephone relay rack.

9848 **COMMERCIAL FREQUENCY AMPLIFIER.** For amplification at 25 or 60 cycles.

9856 **ELECTRONIC TYPE AUDIO FREQUENCY OSCILLATOR.** Delivers current of fair wave form at 1000 cycles. Operates on 6 dry cells.

5412 **BUZZER.** Supplies an interrupted direct current at frequency of several hundred cycles. Operates on 3 volts d-c.

TELEPHONE RECEIVERS *

9871 **TUNABLE TELEPHONE RECEIVER.** Total d-c resistance 120 ohms. Double receiver with headband.

9872 **TELEPHONE RECEIVER.** Total d-c resistance 2000 ohms. Double receiver with headband.

9873 **TELEPHONE RECEIVER.** Total d-c resistance 130 ohms. Double receiver with headband.

9874 **TELEPHONE RECEIVER.** Impedance at 1000 cycles, 30,000 ohms. Double receiver with headband.

POTENTIOMETERS

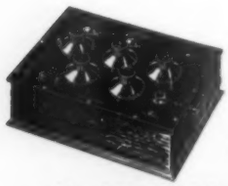
To determine emf as precisely as a given measurement demands, you can choose from a well-rounded line of L&N instruments, each of which applies the basically-sound potentiometer principle in a thoroughly reliable construction. Designs, materials and workmanship are the results of years of extensive experience, during which we have had the close cooperation of leading scientists in developing potentiometers to meet the various needs of research, teaching and testing. Adjustments of slidewire uniformity, of resistor equality and of each potentiometer as a whole are made within conservatively safe limits. Each is a well-built, thoroughly-tested assembly on which the user can depend for full stability and reproducibility of measurements made within error limits which are definitely guaranteed. Each embodies accuracy, sensitivity and readability in such proportion that the precision guaranteed is readily attainable.

From the simplest model to the most precise, each L&N potentiometer is, in its intended service, a strikingly convenient instrument to use. Well-placed, easy-to-grip controls enable the operator, while balancing the potentiometer, to keep an uninterrupted eye on his galvanometer reading device. Auxiliary keys, switches and knobs are simplified, handy. Standard cell can be applied quickly and easily. Binding posts are readily accessible, but so located that, while the instrument is in use, external connections are out of the operator's way.

The earned reputation which attaches to every L&N potentiometer arises out of the fact that each, in its field, is built to give the required precision, with maximum convenience and speed of manipulation, at a cost in keeping with its value to the user.

* "Design of Potentiometers," I. M. Stein, A.I.E.E. Transactions, Vol. 50, No. 4, 1931.

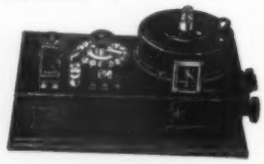
D-C NULL POTENTIOMETERS



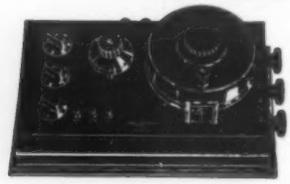
7559
(about 1/20 actual size)



7620
(about 1/12 actual size)



7551
(about 1/12 actual size)



7552
(about 1/12 actual size)



7651
(about 1/16 actual size)



8662
(about 1/24 actual size)

Instrument	List Number	Range	Limits of Error	Refer to Catalog
Wenner Thermocouple Potentiometer (For highly precise measurements of low voltages; primarily for thermocouple work)	7559	High: 0 to 0.11111 volt in steps of 1 μv. Low: 0 to 0.011111 volt in steps of 0.1 μv.	High range: ±(0.01% + 0.5 μv). Low range: ±(0.01% + 0.1 μv).	E-33A(1) E
Wenner Standardizing Potentiometer (Similar to 7559, but for higher voltages)	7558	High: 0 to 1.9111 volts in steps of 10 μv. Low: 0 to 0.19111 volt in steps of 1 μv.	High range: ±(0.01% + 5 μv). Low range: ±(0.01% + 1 μv).	E
White Single Potentiometer (For precision temperature measurements in calorimetry and other low-voltage applications)	7620	0 to 0.01 volt in steps of 1 μv.	±(0.02% + 0.5μv).	E-33A(2) E
White Single Potentiometer (Same as 7620, except for greater range)	7621	0 to 0.1 volt in steps of 10 μv.	±(0.02% + 1 μv).	E-33A(2) E
White Double Potentiometer (Has two sets of measuring dials, controlled by a master switch, so that two widely different temperatures may be measured without resetting dials)	7622	0 to 0.01 volt in steps of 1 μv.	±(0.02% + 0.5 μv).	E-33A(2) E
White Double Potentiometer (Has two sets of measuring dials, controlled by a master switch, so that two widely different temperatures may be measured without resetting dials)	7623	0 to 0.1 volt in steps of 10 μv.	±(0.02% + 1 μv).	E-33A(2) E
Type K-1 Potentiometer (A double-range precision potentiometer for general laboratory use)	7551	High: 0 to 1.61 volts; Low: 0 to 0.161 volt.	When using 3 or more switch studs: low range 0.02%, high range 0.01%.	E-50B(3) E
Type K-2 Potentiometer (A triple-range precision potentiometer for general laboratory use. Additional low range especially useful for thermocouple work, and for checking industrial potentiometer pyrometers. Special terminals provide fixed potentials for checking lab-standard wattmeters. Improved controls make operation easier)	7552	High: 0 to 1.61 volts; Medium: 0 to 0.161 volt; Low: 0 to 0.0161 volt.	When using 3 or more switch studs: high range 0.01%, medium and low ranges 0.015%. When standardized on any range and read on any other range: 0.025%.	E-50B(3) E
Students' Potentiometer (A simplified, moderate-precision potentiometer for educational and general laboratory use)*	7651	High: 0 to 1.6 volts. Low: 0 to 0.016 volt.	Dial resistors and total slidewire resistance alike within ±0.04%; slidewire uniform within ±0.5 division.	E-50B(1) E
Portable Millivolt and Temperature Indicator (For precise checking of thermocouple pyrometers in laboratory and plant, and for general temperature measurements. Used with noble-metal and base-metal couples. Range calibrated on dial switch and slidewire)	8662	High: 0 to 80.5 mv. Low: 0 to 16.1 mv. Reference-junction compensators: 0 to 1 mv, adjustable to 0.002 mv; 0 to 5 mv, adjustable to 0.01 mv. Either may be used with either main range.	Low main range and low-range compensator, ±0.01 mv. Low main range and high-range compensator ±0.02 mv. High main range and either compensator, ±0.05 mv.	E-33A-503 E

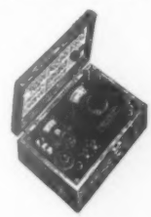
* Separate connections to slidewire and end coils provided, so that slidewire of 7651 can be used in an a-c bridge.

NULL POTENTIOMETERS (Cont'd.)

Instrument	List Number	Range	Limits of Error	Refer to Catalog
Portable Millivolt Indicator (Convenient for pH and other emf measurements. Range calibrated on dial switch and slidewire)	7655	0 to 1.110 volts. Double and triple range instruments on special order.	±0.001 volt.	E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the laboratory, and for general temperature measurements. Range calibrated on dial switch and slidewire. Used primarily with base-metal couples)*	8667	0 to 111mv.	±0.1 mv.	E-33A-503 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the plant, and for general temperature measurements. Used with noble-metal and base-metal couples. Range calibrated on slidewire only)	8657-C	Low: 0 to 16 mv. High: 16 to 64 mv. Reference-junction compensators: hand operated, 0 to 1 mv; 0 to 5 mv. Either used with either main range.	Low main range with either compensator, ±0.05 mv. High main range with either compensator, ±0.15 mv.	E-33A-503 E
Portable Millivolt and Temperature Indicator (Same as 8657-C, except main ranges and compensator ranges in millivolts or temperature, as specified)	8657-X	As specified.	Same as 8657-C.	E-33A-503 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the plant, and for general temperature measurements. Used principally with noble-metal couples. Range calibrated on slidewire only)	8656-B	0 to 16 mv. Reference-junction compensator: hand operated, 0 to 1 mv.	±0.05 mv.	E-33A-503 E
Portable Millivolt and Temperature Indicator (For checking thermocouple pyrometers in the plant, and for general temperature measurements. Used principally with base-metal couples. Range calibrated on slidewire only)	8656-D	0 to 70 mv. Reference-junction compensator: hand operated, 0 to 3 mv.	±0.23 mv.	E-33A-503 E
Portable Millivolt and Temperature Indicator (Same as 8656-B, except main range and compensator range in millivolts or temperature, as specified)	8656-X	As specified.	Same as 8656-B.	E-33A-503 E
Portable Millivolt and Temperature Indicator For body-temperature measurements with hypodermic and skin-surface thermocouples)	8563-CD	25 to 125 F, and −3.9 to +51.7 C for iron and constantan thermocouples. Reference-junction compensator automatic.	Of indicator only: ±0.5 F.	E-33-423 E
Universal pH Indicator (A compact, portable instrument which combines laboratory accuracy and sensitivity with speed and convenience. Direct-reading with its own self-contained glass electrode or with quinhydrone, hydrogen gas or any other electrode following the Nernst equation)	7663	0 to 13 pH in 0.1 pH divisions. 0 to ±1.100 volts in 0.01 volt divisions. Temperature compensator range 0 to 50 C in 1 degree divisions.	pH scale, ±0.05 pH (exclusive of any error in stated pH of buffer solution). Voltage scale, ±0.0037 volt. Error due to control current, less than 0.002 volt per 1000 megohms in measured circuit. Reproducibility, 0.02 pH.	E-96(3) E



7655
(about 1/20 actual size)



8657–C
(about 1/12 actual size)



7663
(about 1/12 actual size)



7662
(about 1/12 actual size)

DEFLECTION POTENTIOMETERS

Instrument	List Number	Range	Limits of Error	Refer to Catalog
Glass-Electrode pH Indicator (Potentiometer of variable current type in which the meter deflection is a complete indication of the measured quantity)	7662	0 to 8 pH and 6 to 14 pH.	±0.1 pH, exclusive of any error in pH of standardizing buffer solution.	E-96(2)
Brooks Model 7 Deflection Potentiometer (For rapid testing of ammeters, voltmeters and wattmeters)	7630	0 to 150 mv.	For combined null and deflection readings, ±(0.02% + 0.03 mv).	E-50B(2) E
Brooks Model 8 Deflection Potentiometer, similar to 7630. (For measuring voltage and current in lamp-efficiency testing)	7640	0 to 1.5 volts.	For combined null and deflection readings, ±(0.02% + 0.3 mv).	E-50B(2) E



7630
(about 1/12 actual size)



7640
(about 1/12 actual size)

* Does not have reference-junction compensator. Use of ice bath is recommended for reference junction.

PRIMARY ELEMENTS, ACCESSORIES, SUPPLIES

We are prepared to supply complete laboratory measuring equipments. In addition to the Standards, Galvanometers, Bridges and Potentiometers listed in this advertisement, the L&N line includes the various additional units and accessories often needed.

For certain applications there is a wide choice of primary elements: for temperature—thermocouples, Rayotubes, resistance thermometers; for pH—glass, calomel, hydrogen, and other electrodes; for electrolytic conductivity—laboratory and industrial conductivity cells.

Accessories are supplied for use specifically with galvanometers and dynamometers. Devices are available for mounting a galvanometer on a tripod, on a table, or on a wall. There is a choice of devices for reading galvanometer deflections with a plane mirror and a convex lens or with a concave mirror; also scales with lamps and telescopes—including a lecture room lamp and scale for demonstrating galvanometer deflections to a large assembly. As voltage source for illumination, an a-c transformer or a d-c resistance unit is used. For use as current dividers, Ayrton shunts in a choice of total resistances are available. For damping a galvanometer or for protecting a galvanometer, standard cell or other instrument against excessive current, a choice of mounted resistors is supplied.

If the user prefers to assemble a bridge from separate units, the 4261 Circular Slidewire or the 4258 Kohlrausch Slidewire is available and the 7651 Students' Potentiometer is equipped with binding posts by means of which its slidewire can be used in a conductivity bridge assembly.

For making up a variety of a-c bridge assemblies, the Campbell-Shackelton A-C Ratio Box is available.

Accessories for impedance measurements at power or audio frequencies include amplifiers; oscillators; phones or galvanometers for use as balance-point detectors.

Where potentiometers are used, we supply a complete line of volt boxes and shunts. With either a null or deflection potentiometer when voltage above the nominal range of the instrument is measured, a suitable volt box may be used.

Specific literature describing primary elements, accessories and supplies not listed here is available on request.

MISCELLANEOUS LABORATORY APPARATUS

TRANSFORMER TESTING APPARATUS *

7190-A POTENTIAL TRANSFORMER TEST APPARATUS. Primary apparatus for laboratory tests. Range 0 to 15,000 volts. Galvanometer not included in price.

7160 POTENTIAL TRANSFORMER TEST SET. For testing potential transformers in service or in the laboratory. Ratio range 95 to 105%. Limit of error ± 0.1% ratio. Phase-angle range, 2 degrees lagging to 2 degrees leading; limit of error ± 5 minutes. Operates on 115 volts, 60 or 25 cycles. Includes galvanometer.

7173 THREE-PHASE PHASE SHIFTER. For use with 7160 and 7150.

10621 PHASING TRANSFORMER. For operating 7173 Phase Shifter on two-phase.

7180-A CURRENT TRANSFORMER TEST APPARATUS. Primary apparatus for laboratory tests. Range 0 to 1000 amperes. Galvanometer not included in price.

7181-A CURRENT TRANSFORMER TEST APPARATUS. Similar to 7180-A, but range 0 to 2500 amperes.

7182-A CURRENT TRANSFORMER TEST APPARATUS. Similar to 7180-A, but range 0 to 5000 amperes.

7150 SILSBEE CURRENT TRANSFORMER TEST SET. For testing current transformers in service or in the laboratory. Similar to 7160.

7156 SET OF ADJUSTABLE BURDENS. Provides impedance when instrument transformers cannot be tested with working burdens. Resistance range 2 ohms, adjustable in steps of 0.04 ohm. Inductance range 5 millihenrys, adjustable in steps of 0.1 millihenry.

DIELECTRIC PROPERTIES TESTING APPARATUS *

1510-A1 POWER FACTOR MEASURING ASSEMBLY. Primarily for high-voltage production testing of cable in reel lengths to determine power factor of insulation by the phase-defect compensation method.

5602-A2 GUARDED INSULATION-RESISTANCE TEST ASSEMBLY. For accurate measurements of insulation resistance, in plant or test room. Designed to conform to A.S.T.M. D-257.

5602-A1 GUARDED INSULATION-RESISTANCE TEST ASSEMBLY. Similar to 5602-A2, but designed specifically for research in laboratory testing where greater degree of sensitivity may be desired.

MISCELLANEOUS APPARATUS

42200-A1 ELECTRO-CHEMOGRAPH. For dropping mercury cathode method of chemical analysis. For more details, see page 498.

6700-A1 KNORR-ALBERS MICROPHOTOMETER. For spectrographic analysis. Automatically scans spectrographic plates or films and draws line-density records on wide strip-chart.

* Further information in Catalog E.

MANY LABORATORY APPLICATIONS REQUIRE AUTOMATIC INSTRUMENTS



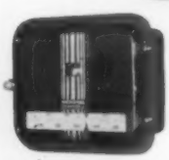
Chart 9¾" wide

Model S Micromax



Model R Micromax

Chart diameter 10"



Model C Micromax

Scale 9¾" wide

For measuring laboratory conditions about which continuous data is required, many technicians are relying on L&N electrical balance-type instruments. Embodying sound potentiometer or bridge principles, Micromax instruments are used for any condition measurable in terms of resistance or potential change, and may be calibrated to read directly in temperature, pH or other units.

To draw a detailed record automatically—Model S Micromax records on a wide strip-chart the conditions detected at one or as many as sixteen points. It indicates; often is supplied to control automatically.

To indicate with unusual boldness—Model R Micromax has a big pointer which moves around a circular scale. At the same time, it records on a 24-hour round chart. Can be supplied to operate signals or controls. See Catalog N-33A(2).

To control and indicate temperature—no record . . . Model C Micromax holds within narrow limits the condition being measured. Two pointers show actual temperature and control point. See Catalog N-33A(3).

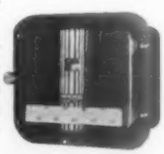
To control—no record, no index . . . Model NC Micromax provides simple control of temperatures detected by thermocouple or Thermohm. Can operate signals or alarms. See Catalog N-33A(4).

To record at high speeds—Speedomax Type A measures temperature of moving objects, speed, radio field strength or other applications where speed is essential. See Catalog N-33B.



Chart 9¾" wide

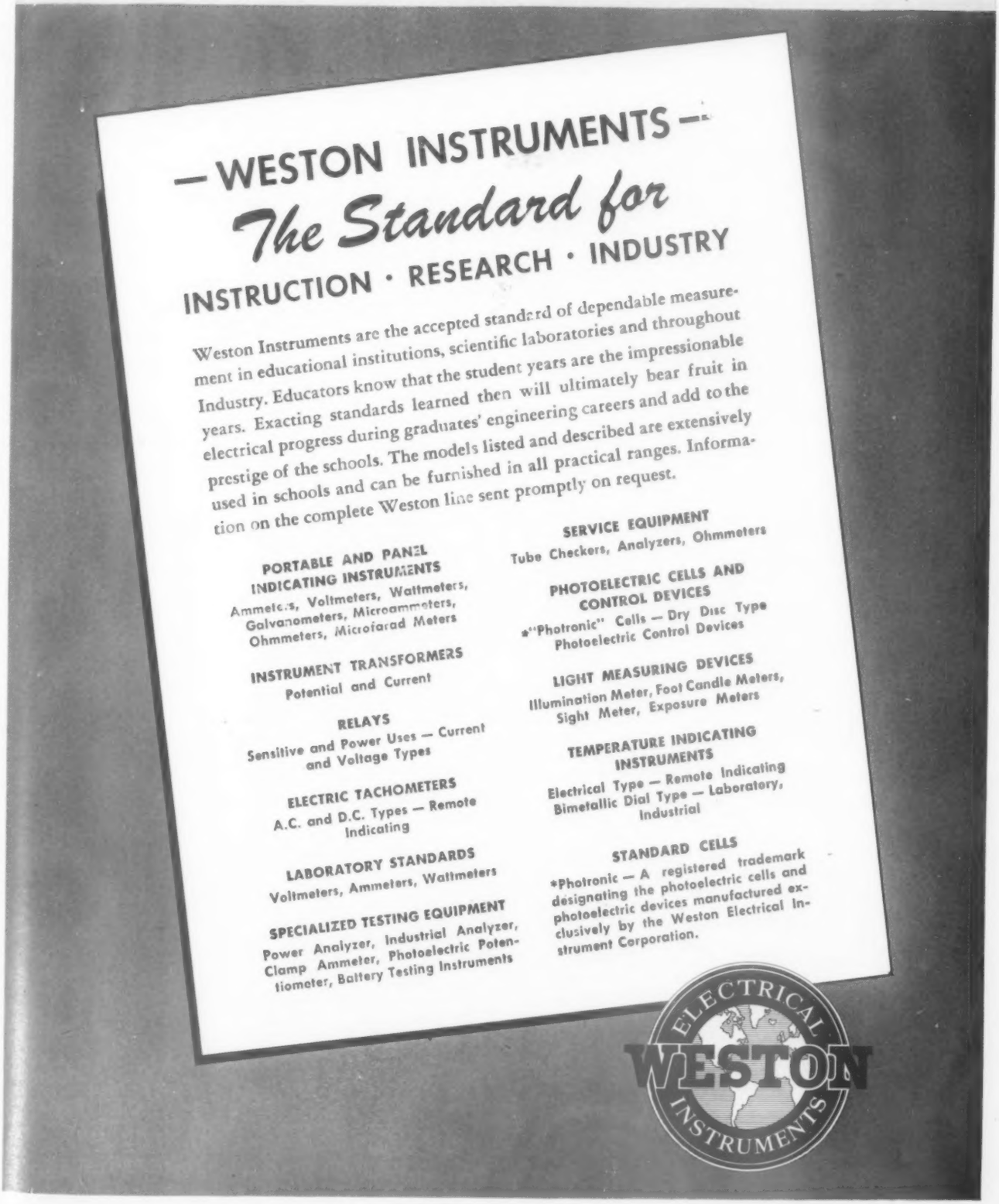
Speedomax Recorder Type A



Model NC Micromax Scale 9¾" wide

Weston Electrical Instrument Corporation

601 FRELINGHUYSEN AVENUE, NEWARK, N. J.



WESTON ELECTRICAL INSTRUMENTS — Instruments for Every Classroom



Model 430

Portable A C and D C

Voltmeters • Ammeters • Single Phase Wattmeters

Extensively used in technical schools and throughout industry for general test work, because they are extremely compact, and combine unusual ruggedness with dependable accuracy. The unusually large scale opening permits good visibility of the long hand calibrated mirror scales with knife edge pointers. Contained in molded Bakelite cases provided with leather carrying strap. Size approximately 5-1/16″ x 6-1/32″ x 3-1/2″. Weight approximately 3-1/2 lbs.



Model 622

AC and DC Ultra-Sensitive Instruments

A group of high-sensitivity instruments requiring no leveling. Ideal for precision measurement of potentials and minute currents involving electronics, thermo-couples or laboratory research. Available as DC Voltmeters, Millivoltmeters, Milliammeters, Microammeters. Also AC Thermo Ammeters, Thermo Milliammeters, Thermo Voltmeters.



Model 280

Miniature DC Instruments

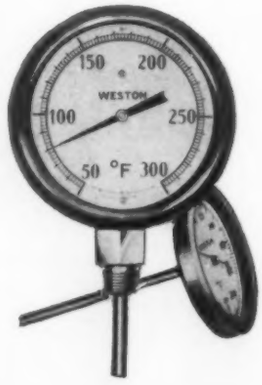
Available in single and multi-range, portable models which are most convenient for student use on a variety of testing. Features are: 1% accuracy, ruggedness, hand calibrated mirror scales, knife edge pointers and magnetic shielding. Size 4-2/5″ x 4-3/5″ x 1-1/2″.



Model 375

Student Galvonometer

Made in two models, with or without mounting base. Widely used in school laboratories where dependability and low cost are first considerations. Sensitivity is 22 microamperes. Resistance 23 ohms. Models also available where medium or extreme sensitivity is required.



TEMPERATURE GAUGES

Laboratory and Industrial Types

Weston all-metal temperature gauges have large gauge-type scales which provide extreme readability, even at a distance. The laboratory model is guaranteed accurate within ½ of 1% over full scale and the industrial types within 1% of full scale. As there are no fragile parts, accuracy is maintained over far longer periods and they withstand vibration and accidental breakage.

and Laboratory Requirement

WESTON ELECTRICAL INSTRUMENTS

Model 785

DC-AC Industrial Circuit Tester

Ultra-Sensitive • 27 Ranges

A low current-drain instrument for school laboratories and general industry. Designed to perform a wide range of electrical measurements of currents, voltages and resistances. It has a sensitivity of 20,000 ohms per volt for DC and 1000 ohms per volt for AC. Especially useful for checking and trouble-shooting on electronic devices, sensitive relays, oscilloscopes and other apparatus with critical electrical settings. Comes equipped with test leads; also self-contained battery to provide potentials for resistance readings. Furnished in a sturdy, portable case with test lead compartment and removable cover.





Model 697

Volt • Ohm Milliammeter AC • DC

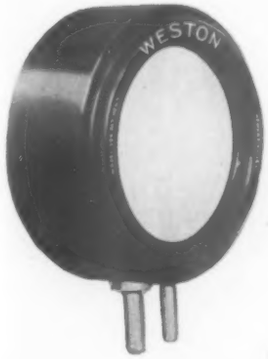
Provides a carefully selected group of ranges for most requirements for measuring AC and DC voltages, direct current and resistance values. Sensitivity 1000 ohms per volt. Self-contained battery provides potentials for resistance measurements. Comes equipped with test leads for insertion in pin jacks on panel. Size 5-9/16" x 3-3/4" x 3-9/16". Approx. weight 1-3/4 lbs.



Model 564

DC Volt-Ohmmeter

Model 564 is somewhat similar in appearance to Model 697 and will appeal to school heads where testing and experimentation require only DC voltage or resistance measurements. The ranges have been carefully planned to provide the electrical measurements frequently needed for student instruction. Size approximately 4-1/2" x 3-5/8" x 3-9/16". Approximate weight 1-3/4 lbs.



Model 594—Type 3

Photronic Cell

Weston Photronic cells are of the barrier-layer, self-generating type. They combine stability with high sensitivity, and freedom from fatigue. Can be safely operated up to temperatures of 140° F. Bakelite case and threaded terminals are standard equipment; can also be supplied with weather-proof housing and prongs for UX socket.



Model 633

AC Clamp Ammeter

Readings are speedily taken with this compact circuit checker simply by closing the rubber-covered jaws around the conductor or switch blade. No hook-ups necessary, no interruption of circuit. Six ranges available through convenient thumb switch Simple and safe for student use. No shorting of adjacent conductors.

WESTON PANEL INSTRUMENTS

Design instructors will appreciate the wide selection of Weston panel instrument models. They will fill every requirement for attractive appearance, utility and dependable measurement.



Model 801 Group — Rectangular

Exceptional scale length, readability, and ease of mounting are the features of this general purpose group. Made in all types and ranges for practical AC and DC use. Cases are black, semi-flush Bakelite 4-1/4″ x 3-15/16″. Scale length 3.17″.



Model 640 Group — Round

A line of AC and DC instruments available in all practical ranges. Standard case is 4-3/8″ dia., flush Bakelite. Surface Bakelite and flush or surface metal cases are optional. Scale length 3.34″.



Model 301 Group Round or Rectangular

A group of compact AC and DC panel instruments, measuring approximately 3-3/8″ dia., available in all required types and ranges. Round shapes furnished with flush Bakelite cases. Rectangulars, flush or surface in either Bakelite or metal.



Model 269 Group — Fan Shape

A very attractive group of wide range DC instruments with the longest scales ever attained for comparable sizes. Accuracy 1%. Available in four scale lengths 2.6″—4″—5.8″—7.32″; and supplied in surface types, black finished steel cases.

WESTON ILLUMINATION METERS

Weston Illumination Meters

Model 703, pocket size and entirely self-contained. Measures directly in foot-candles, range 0-75 fc. Available with Viscor filter for measuring all types of lighting direct, regardless of color characteristics.

Model 614, has three ranges, available through range changing switch . . . 0-60/0—120/—0-600/foot candles. Also available with the Viscor filter as described above.



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G-E Will Help You Bring Your School Laboratory and Shop Up-to-date

FEDERAL, State, and local governments are planning to give adequate technical training to the returned soldiers, sailors, and marines who desire it.

Highly trained technical workers are and will continue to be much in demand. Classes in laboratory and shop will increase in size and in numbers. New and enlarged accommodations will be required.

Competent G-E engineers will be glad to recommend laboratory equipment for the various types of courses required, and to help also in the preparation of shop and laboratory layouts, as illustrated by Fig. 1.

Various General Electric Company services include:

- Advisory service to educators
- Technical and descriptive publications
- Special educational aids—such as motion pictures and illustrated lectures
- Proper laboratory equipment.

To assist our engineers, we have retained the services of experienced educators. Hence, G-E recommendations can be relied upon to conform to the best educational and industrial practice. There is no charge for this advisory service.

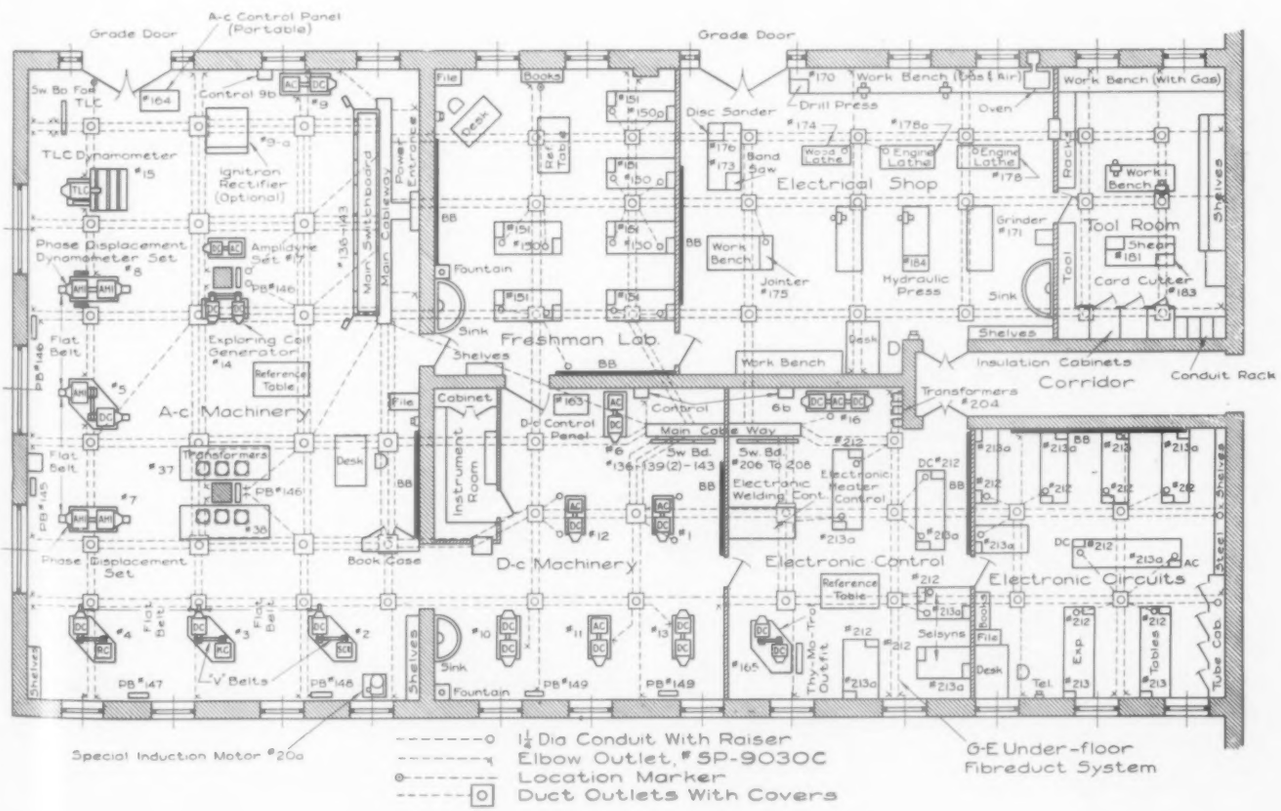


Fig. 1.

LABORATORY AND SHOP EQUIPMENT SPECIFICATIONS—BULLETIN GED-1093



THIS publication is being widely used by educators in selecting equipment for the electrical shop or laboratory. It is an enlarged revision of GEB-62 which has been used extensively for years as a guide by electrical teachers throughout the country.

The bulletin reflects present-day trends in technical education. In particular, the Electronics Laboratory section has been completely revised and expanded to list apparatus which should be adequate to provide apparatus for a well-balanced course in Electronics Control. The selection of a dead-front switchboard for the laboratory was the result of a marked trend in industrial practice to that type of board.

As described later, three price groups, "A," "B," and "C," have been retained in the revised bulletin. It is recognized that schools differ in the scope of the training offered and in the money available for laboratory expenditure. Apparatus in the lower-priced groups forms part of the complete equipment, so that a school which wishes to expand its laboratory will find that none of the apparatus originally purchased need be discarded. The lists are merely suggestive, as they will not fit all types of courses. Recommendations covering special courses will be prepared and laboratory layouts made on request. There is no charge for this service.

General Suggestions

The apparatus lists are based on a class of from 18 to 25 students. This is about the maximum which an instructor can handle efficiently at one time. However, with the larger equipment groups, there should be sufficient apparatus to permit several classes to operate at one time if the classes are of different grades so that experiments can be diversified.

In general, the apparatus selected is of standard commercial design. In some instances, special terminal boards have been provided or extra leads brought out in order to facilitate the work in the laboratory. In a few cases where standard apparatus is too large for efficient laboratory operation, special laboratory models have been designed. These special machines embody all of the basic principles of the commercial types, but are reduced in size so that they will operate satisfactorily with other laboratory apparatus.

Although some direct-connected motor-generator sets are listed, the V-belt drive has proved to be one of the most satisfactory types for certain laboratory motor-generator sets. It is convenient, positive, and quiet, and its added flexibility is an advantage in the laboratory. One of the main advantages is that belts

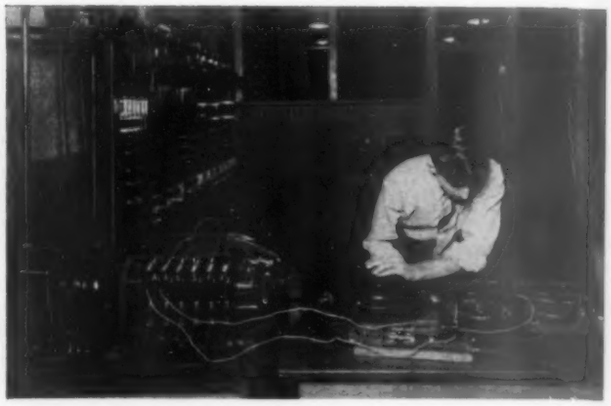


Fig. 2.

The new G-E *Terminal Board No. 4* (listed in Bulletin GED-1093) connected for testing the d-c unit of a motor-generator set. In this case, the student must make all connections, test them for polarity, etc.

can easily be removed, thereby allowing the machines of the set to be operated individually.

Cement mounting blocks 22 inches high are recommended. The blocks should not be fastened to the floor, and it is well to use two or three layers of corrugated pressboard or ½ inch of Celotex between the blocks and the floor. This arrangement decreases the noise and facilitates later rearrangement of the equipment, if necessary.

In preparing the lists, General Electric has kept a fairly definite proportion between the amounts to be spent for the various groups of equipment, such as machines, loading devices, control equipment, instruments, etc. A safe plan is to allow something under 25 per cent of the total sum available for instruments, something under 33⅓ per cent for motors and generators, and the remainder for the rest of the equipment.

Another rule, in planning a new building for technical courses in mechanical and electrical work, is to allow twice as much floor space for the electrical laboratory as for the machine shop, but about twice as much money for the machine shop as for the electric equipment. This is assuming that the same number of students is to be instructed in each course.

Laboratory Power Supply and Switchboard

An adequate power supply with good voltage regulation is essential for accurate laboratory work. The dead-front switchboard now recommended and standardized for laboratory use provides for a 3-phase, 220-volt, 200-ampere main power supply, and a single-phase 110/220-volt, 75-ampere, 3-wire supply. The main d-c feeder panel is also designed to handle 200 amperes, d-c, at 125 volts.

General Electric has given special attention to the design of this laboratory switchboard. It is made up of standard equipment and is exceptionally well adapted for both a-c and d-c machine operation and general laboratory distribution. Panels can be operated as units or as part of the entire board. Schools can, therefore, build up the complete board as enrollment grows and money becomes available.



Fig. 3.
The drum controller provides a ready means of speed control on this belt-driven motor-generator set. Convenient terminals facilitate connections. An a-c control panel is shown in the background.

This redesigned laboratory switchboard familiarizes the student with modern practice. However, that it is still an educational board has been kept in mind, and its educational features have been retained.

In the layout of the laboratory, adequate distribution facilities from the switchboard to the laboratory stations should be given careful study. For this purpose, G-E plug-switch panels can be placed at advantageous points in the laboratory to facilitate the interconnection of various machines through the main switchboard. They are a vital part of the distribution system.

Smaller test-table outlet boxes have also been designed for use with lighter apparatus, such as is found in the electronics and physics laboratories.

LAYOUTS

In many schools, the economical use of floor space necessitates great care in selecting the location of the switchboard, the proper placing of floor ducts, and the exact setting of the apparatus. General Electric engineers will assist schools in deciding these important questions. Typical layouts showing suitable arrangements of the "A" and "C" groups of equipment are shown in Bulletin GED-1093. However, the Company will be glad to prepare special recommendations and make layouts where the standard lists are not suitable.

Those desiring to take advantage of this service should give the following information, so that recommendations will adequately meet all requirements:

1. Is the school to offer technical, vocational, or industrial-arts courses?
2. Is it a day or evening school?
3. What is the length of the course in years, days per week, and hours per day?
4. What is the average number of students who will be using the laboratory at one time?
5. Will the school be held in a new or old building?
6. What type of floors will be used, and will the laboratory be on the ground floor or above?
7. Include a simple floor plan of the rooms available, and indicate the scale, the size and location of windows, doors, partitions, sinks, columns, etc.
8. What power supply is available, and where is it located with reference to each room?

GROUP "A" EQUIPMENT

A careful study of the bulletin will show that **Group A** provides sufficient equipment for a first-class technical high school, technical institute, or as a basic list for an engineering college. In a technical high school, it will be sufficient for a high-grade four-year electrical course for the instruction of some 250 students per day, allowing a 2-period session for each class. Careful scheduling and diversification of experiments should make it possible to care for four, or possibly five, classes of 25 students each at one time.

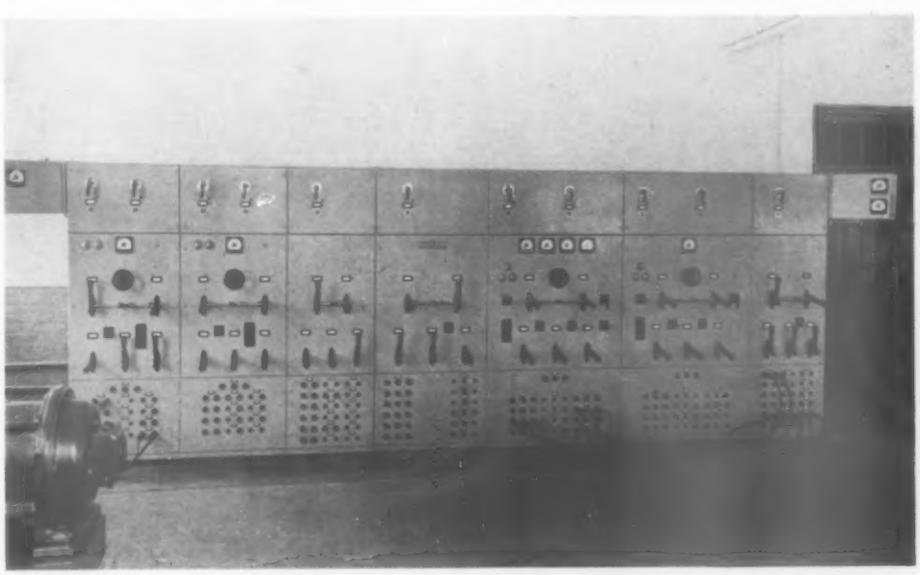


Fig. 4.
New dead-front-type main laboratory switchboard

This equipment is especially well adapted for the trade-extension or co-operative apprentice training classes that are springing up rapidly as a result of State and Federal aid.

GROUP "B" EQUIPMENT

This intermediate group will provide minimum equipment for a technical institute, and is sufficient for a high-grade technical high school. The additional items beyond those of **Group C** will materially broaden the scope of the work. Not only are more advanced experiments possible, but if sufficient room is available and the work is diversified, it should also be possible to handle three classes in the laboratory at one time. This group also includes sufficient electronics equipment for a very thorough course in industrial electronics.

GROUP "C" EQUIPMENT

The minimum, or **Group C,** equipment is suggested as the starting minimum for schools planning technical courses. It will, in most cases, meet the minimum requirements for State approval of technical high schools in small communities. If the full amount of money is not available at the start, the elementary equipment can be purchased, and additional items required for advanced work can be purchased as the class advances.

The group includes sufficient apparatus to care for the simultaneous operation of two classes of from 20 to 25 students each, provided they are of different years or grades. The equipment is selected with a view of affording practical demonstrations of the fundamental theories and laws set forth in textbooks on elementary electricity, magnetism, and electronics. The apparatus is primarily for classes of beginners. A number of shop items and instruments of the types normally used by beginners is included.



Fig. 5.
The new G-E educational *Terminal Board No. 3* (listed in Bulletin GED-1093) used on a d-c generator. The connections shown are for a standard load-voltage-characteristic test.



Fig. 6.
In this illustration, the d-c unit shown in Fig. 5 is used to provide load for an a-c motor. The required change in connections is made quickly by means of the spring terminals on the terminal board.

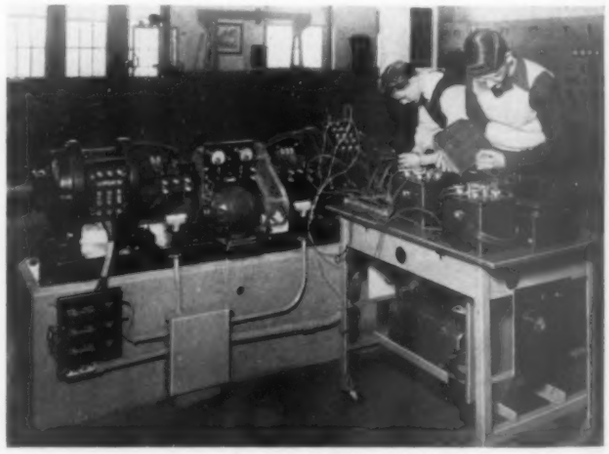


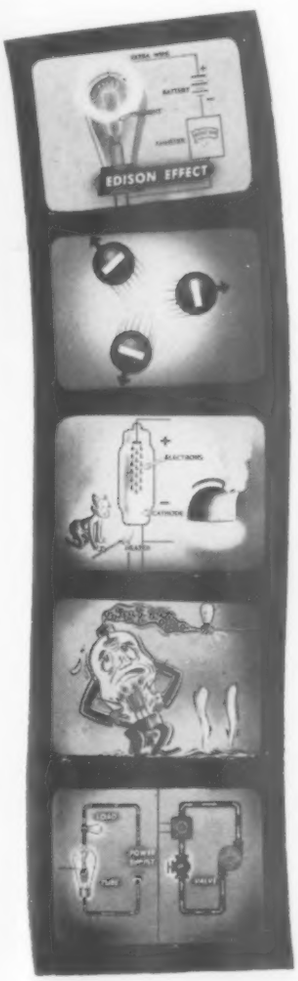
Fig. 7.
A portable three-phase reactor in use with *Motor-generator Set No. 7* (listed in Bulletin GED-1093). The instrument on the control panel shows the d-c or saturation current, and the small rheostat button at the right provides an easy means of controlling the load on the alternator. The students are checking the speed of the set and the connections.

ELECTRICAL LABORATORY APPARATUS AND EDUCATIONAL SERVICE, BULLETIN GEA-1185

Illustrates and describes G-E laboratory apparatus particularly adapted for use in vocational schools, technical high schools, and colleges. Standard commercial apparatus is usually recommended. Where the cost, size, and power requirements of such standard equipment are prohibitive, alternative apparatus specially designed for the school laboratory usually can be furnished.

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When the lamp is lighted and the filament glows, current flows through the extra wire, even though it is not connected with the filament itself. This phenomenon (Edison Effect) demonstrates the underlying principle of electronic tubes.

● ● ● ●

Electrons, being negatively charged particles, repel each other and hinder the flow of other electrons from cathode to anode. This repelling action is called "space-charge" — a factor of very great importance in electronic-tube design.

● ● ● ●

In some types of electronic tubes, we "boil" the electrons out of the cathode with heat, much as boiling water produces steam.

● ● ● ●

A gas-filled tube (phanotron) can be damaged if forced to operate before its cathode has been heated sufficiently to emit the required amount of electrons. To prevent such abuses, most electronic equipments have automatic timers built in to protect rectifier tubes.

● ● ● ●.

In our electric circuit, we use a second voltage supply called the control, or grid, voltage. It performs much the same function as the control handle on the valve in a hydraulic circuit.



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Photo News Service, semi-monthly news posters giving brief accounts of recent laboratory and manufacturing developments. Published on the first and fifteenth of each month, these posters are now being furnished to some several thousand schools and colleges. The posters are sent free, to teachers only, at their school address.

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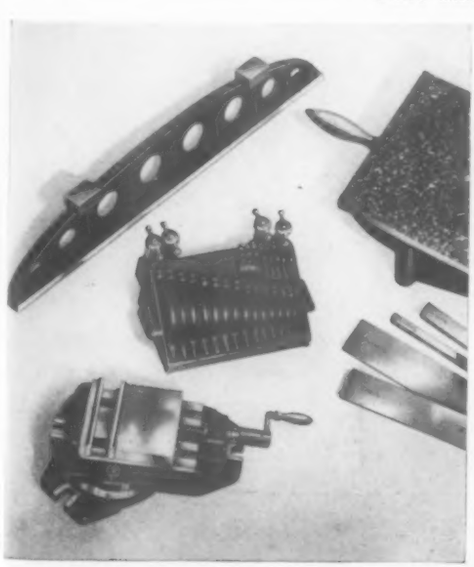
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- Glass Etching
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THE LUFKIN RULE COMPANY

Saginaw, Michigan, U. S. A.

NEW YORK: 106–110 Lafayette Street

LUFKIN

PRECISION TOOLS:

- Micrometers
- Squares, Combination, etc.
- Calipers
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- Steel Scales
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- Drill Grinding
- Feeler
- Planer
- Radius
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- Telescoping
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Tool Sets, Students

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MEASURING TAPES:

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MILLERS FALLS COMPANY

Greenfield Massachusetts

28 Warren St., New York City — 100 So. Jefferson St., Chicago, Ill.

America's tool production, spurred by war's demands, has increased to such an extent in the past year that a larger proportion of the output is now available for essential civilian uses.

Choose Millers Falls Tools for school use, and train students in the use of tools which most of industry considers standard.

Available through school shop suppliers everywhere. Write for catalogs.



HAND AND BREAST DRILLS

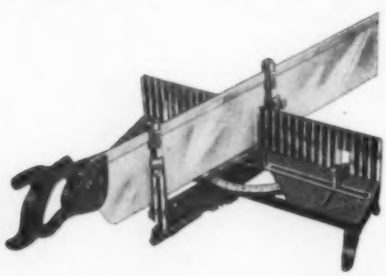
Straight and ratchet, enclosed gear, single and two-speed — 27 models. Bench drills and boring machines.

PLANES

An unbeatable line, developed through 75 years of quality tool-building. Many kinds and sizes —smooth, jack, fore, jointer, block, rabbet, router, rabbet and fillister, scrub, and scraper.

MITRE BOXES

Complete line of mitre boxes, metal-cutting boxes, portables, open fronts. Best known are the famous Goodell All-Steel and Langdon Acme—high quality, great value.

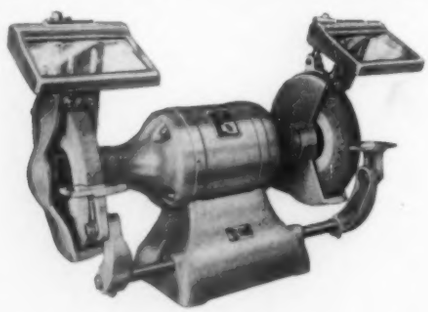


LEVELS

For every purpose and condition of service; 18 wood models, 5 iron, others.

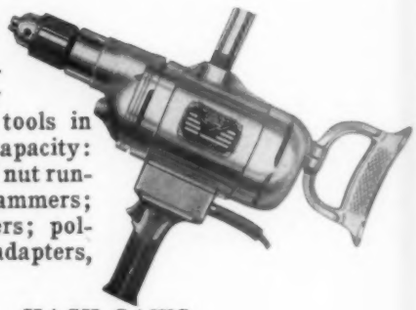
BENCH GRINDERS

Complete line—1/3 h.p. to full 1 h.p. All voltages, cycles, single or three-phase. Eye-shields, lights, pedestals.



ELECTRIC DRILLS

Complete line—3/16" to 1". Other portable electric tools in every speed and capacity: screw drivers and nut runners; grinders; hammers; saws; disc sanders; polisher. Stands, adapters, accessories.



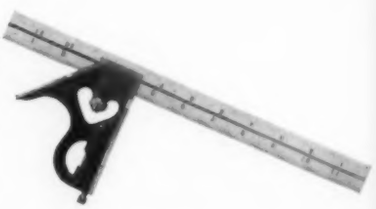
HACK SAWS

Finest frames ever made, many sizes and styles. Blades for all uses: Tuf-Flex, general-purpose hand blade, super-tough, super-flexible, cuts thin-walled tubes or tough tool-steel rods without stripping or breaking. Blu-Mol Double-Life, sensational new blade with cutting edges on each side, now in widespread industrial use, should be demonstrated in every school shop.



PRECISION TOOLS

Combination squares: precision ground, etched graduations and figures, with and without level and scriber. Also: rules; micrometers; thickness gauges; calipers and dividers; screw pitch, depth, center and surface gauges; squares; sets; and bevel protractors.



BRACES

Finest line of braces made: standard, ratchet, corner, whimble, angular. Proved design, ball bearing construction, free action ratchets. Easy to handle, they meet every boring requirement with speed and efficiency.



STANLEY TOOLS

EDUCATIONAL DEPARTMENT

New Britain, Conn.



THE L. S. STARRETT COMPANY

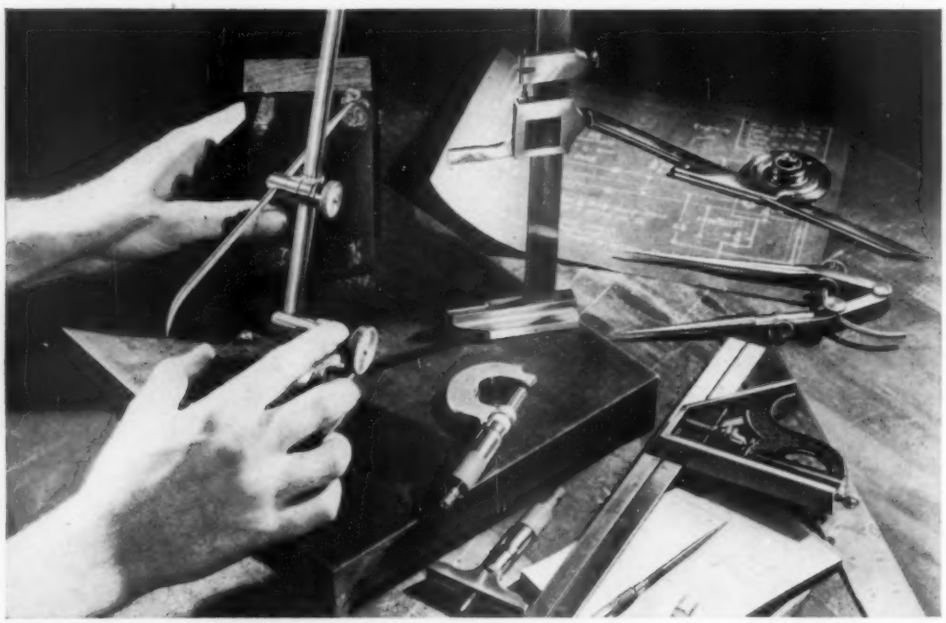
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PRECISION MEASURING TOOLS • DIAL INDICATORS • HACKSAWS
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STARRETT EDUCATIONAL BLUE PRINT SETS

are a valuable and practical instruction aid on the use of precision tools. The Set consists of fourteen blue-printed 8" x 10½" punched sheets, each illustrating an important tool and its uses. Furnished to instructors and students at cost — 10 cents per set.

THE fine workmanship and lasting accuracy that have made Starrett Tools the choice of skilled machinists have also made them standard school shop equipment. Give your students the added incentive of working with Starrett rules, tapes, squares, micrometers and similar measuring tools—the tools that are "standard for accuracy."

For complete information, write for Starrett Catalog No. 26 SU.



THE STARRETT BOOK FOR STUDENT MACHINISTS

Scores of instructors are using this book as the handiest source of information budding machinists must have about tools, machines and modern methods. Prepared in cooperation with leading vocational training experts it is written in simple shop language, contains more than 200 illustrations and 30 useful reference tables. Available through your local Starrett Tool distributor at seventy-five cents a copy. Descriptive Folder furnished on request.

THE BLACK & DECKER MFG. CO.

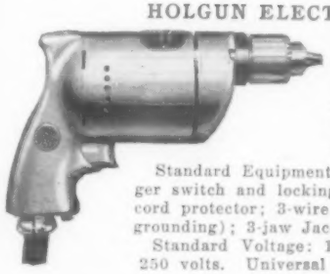
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Black & Decker
ELECTRIC TOOL HEADQUARTERS

BRANCHES IN
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HOLGUN ELECTRIC DRILL



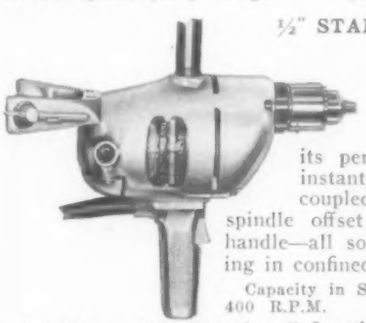
An all-purpose drill—perfectly balanced, perfectly proportioned, of surprising compactness and smooth, rugged power for heavy duty production work.

Standard Equipment: 2-pole automatic-release trigger switch and locking pin, mounted as a unit with cord protector; 3-wire cable and plug (3rd wire for grounding); 3-jaw Jacobs chuck and key.

Standard Voltage: 110; also available for 220 or 250 volts. Universal Motor.

¼" Std. Holgun	Standard Speed	Low Speed
Capacity in Steel	¼"	¼"
No-Load Speed	1700 R.P.M.	500 R.P.M.
Weight, Net	3 lbs.	3⅛ lbs.
Overall Length	6¾"	7⅛"
Spindle Offset	¾"	¾"
Code No.	345	346
Price, complete, specify voltage	$32.50	$38.00
Heavy Duty Holgun—End Handle		
Capacity in Steel	¼"	¼"
No-Load Speed	1700 R.P.M.	500 R.P.M.
Weight, Net	3¾ lbs.	4 lbs.
Overall Length	7¾"	8⅜"
Spindle Offset	¾"	¾"
Code No.	457	460
Price, complete, specify voltage	$36.00	$41.50
Heavy Duty Holgun—Side Handle		
Capacity in Steel	¼"	¼"
No-Load Speed	1700 R.P.M.	500 R.P.M.
Weight, Net	3¾ lbs.	4 lbs.
Overall Length	7⅞"	8½"
Spindle Offset	¾"	¾"
Code No.	459	462
Price, complete, specify voltage	$36.00	$41.50

½" STANDARD DRILL



This drill is a full 3½ inches shorter than the previous model, and 2½ pounds lighter in weight. You'll note its perfect operating balance instantly; also the close-coupled construction, minimum spindle offset and horizontal spade handle—all so important when drilling in confined space.

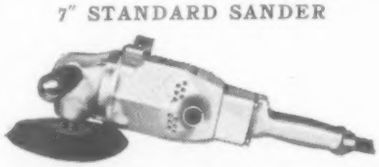
Capacity in Steel, ½"; No-Load Speed, 400 R.P.M.

Net Weight, 10¾ lbs.; Overall Length, 13¾".

Price, complete, specify voltage—(Code No. 361) $53.00

Available for 32, 110, 220 or 250 volts. Universal Motor.

7" STANDARD SANDER



The popular general-purpose Sander for varied shop use.

No-Load Speed, 4200 R.P.M.; Net Weight, 12¾ lbs.

Overall Length, 17½"; Pad Diameter, 7".

Price, complete, specify voltage—(Code No. 92) $53.00

ELECTRIC BENCH GRINDERS

6" JUNIOR BENCH GRINDER



A full quality Black & Decker unit with ball bearings throughout, wheel guards, tool rests and convenient handle — unusually low in price.

Wheel Size ..... 6" x ⅝" x ½"

Motor Rating ..... ⅛ H.P.
Not universal

Price for all 1-phase A.C. voltages and cycles $22.50

6" HEAVY DUTY BALL BEARING BENCH GRINDER

For heavy duty service and longer life this unit is equipped with ball bearings, also enclosed wheel guards, tool rests and handle.

Wheel size ..... 6" x ¾" x ½"
Not universal

Motor rating ..... ⅓ H.P.

Price for 110 volts, 50-60 cycles,
Single phase A.C. voltages only $38.00
All D.C. voltages only 42.00



ELECTRIC PORTO-SHEAR

New, compact, perfectly balanced sheet metal shear for steel, galvanized iron, monel and stainless; copper, aluminum and lead. Easily follows straight or irregular pattern line and cuts to a minimum radius of ¾". Blades are easy to sharpen and adjust for any thickness up to capacity.

Specifications	No. 18 Gauge Porto-Shear	No. 16 Gauge Porto-Shear
Capacity: in Steel (U. S. Std.)	18 gauge	16-gauge
Cutting Speed: No-Load	2500	2500
(Strokes per minute): Full-Load	1500	1500
Weight: Net	5½ lbs.	8½ lbs.
Overall Length	9⅛"	12⅛"
Code No. (specify voltage)	258	259
Price, complete	$60.00	$76.00

VACKAR ELECTRIC VACUUM CLEANER



The No. 95 Vackar is a super-powered cleaner for both automotive and industrial use. With both inlet and outlet hose connections, it can be used as a vacuum cleaner or a blower. Motor and mechanism are completely protected from moisture and unharmed under such use. Ideal all-purpose cleaner for heavy-duty service in garages, shops, factories, etc.

Dimensions: Height ..... 28"
Top Diam. ..... 16¼"
Base Diam. ..... 18½"
Sealed Vacuum Pull ..... 65"
Weight: Net ..... 52 lbs.

Price, complete, specify voltage (Code No. 425) $137.50

Standard voltage 110; also available for 220 or 250 volts.

Complete line includes: Drills, Drill Stands, Hole Saws, Screwdrivers, Nut Runners, Tappers, Hammers, Saws, Glue Pot, Bench Grinders, Die Grinders, Portable Grinders, Shears, Sanders, Buffers, Vacuum Cleaners, Valve Shop, Valve Refacers, Valve Seat Grinders, Valve Lapper and Supplies.

COMPLETE CATALOG SENT ON REQUEST.

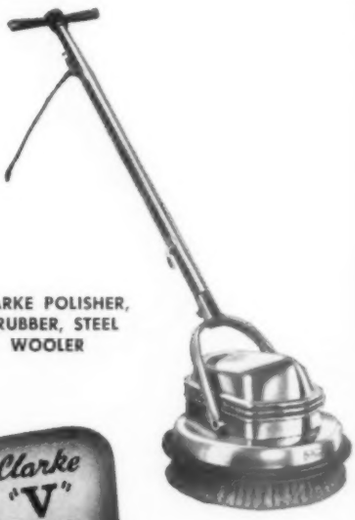
CLARKE SANDING MACHINE CO.

Muskegon, Michigan

Clarke

A NAME TO REMEMBER

● Clarke Floor Finishing Equipment Is Fool-Proof, Easy to Handle, Gives Greater Production, Has Longer Life and Lower Upkeep.



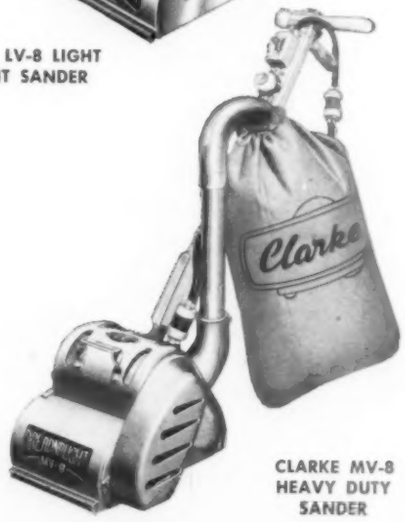
CLARKE POLISHER, SCRUBBER, STEEL WOOLER



CLARKE V-5 EDGER



CLARKE LV-8 LIGHT WEIGHT SANDER



CLARKE MV-8 HEAVY DUTY SANDER

SKILSAW, INC.

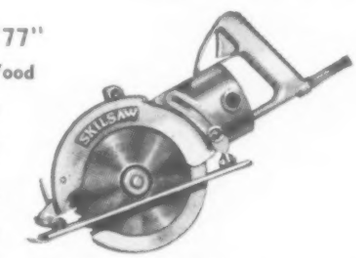
Chicago 30, Illinois

Manufacturers of Portable Electric SkilTools

There is a Portable Electric SkilTool to speed up every sawing, drilling, sanding or grinding job. Manual training and shop students turn out finer work, are better fitted for jobs in industry, carpentry, aviation maintenance, and other fields, when they learn with SkilTools. School maintenance men appreciate the time and labor saving possible with these modern tools on such typical jobs as refinishing tables, desks, lockers, resurfacing blackboards, etc. Ask your regular school supplies distributor for a copy of the latest catalog on SkilTools.

SKILSAW MODEL "77"

Cuts 2⅜" Deep in Wood



One of several models available, Model "77" is the greatest value among 7¼" saws. Crosscuts 2" rough lumber, bevel-cuts 2" dressed lumber at 45°. Quick adjustment for both depth and bevel cutting. Fast in cutting metals, stone, concrete, tile and many composition materials. Maximum cutting capacity in wood 2⅜". Base adjusts vertically from ¾" to 2⅜". Automatic telescoping guard shields saw blade when not cutting. Length overall 17¼". Net weight 15 lbs. Equipped with one combination blade; 10 ft. of 3-conductor cord and connector; steel permanent carrying case; wrench; lubricant. Standard voltage 115, D.C. or A.C.

MODEL "77" ..... **each $105**



BELT TYPE SKILSANDER MODEL "ZP"

3" Wide Belt

Compact, streamlined, perfectly balanced, the ideal sander for manual training students or school maintenance work. Produces a perfectly smooth, ripple-free finish . . . speeds all sanding of wood, metals, stone and composition materials. Belt easily removed or centered. Momentary contact trigger switch for safety. Free belt speed 1200 ft. per minute. Size overall 4¼" x 13¼" x 7" high. Net weight 13¼ lbs. Equipped with resilient backed metal pad; 10 ft. of 3-conductor cord and connector; medium grade SkilSander Belt; lubricant. Standard voltage 115, D.C. or A.C.

MODEL "ZP" ..... **each $88**

DISC TYPE SKILSANDER MODEL "G"

7" Heavy Duty



This tool is ideal for grinding down welding beads, removing scale from castings, etc. Used with sanding discs, wire cup brushes, cup grinding wheels and other accessories to handle every sanding or grinding job. No-load speed 3600 R.P.M. Length overall 16¾" not including pad. Net weight 12½ lbs. Equipped with 10 ft. of 3-conductor cord and connector; detachable handle; tool rest; 7" pad; 3 sanding discs, wrench. Standard voltage 115, D.C. or A.C.

MODEL "G" ..... **each $73**

SKILDRILL MODEL "80"

½" Special Duty



Only 11½" long overall—3½" wide — compact, streamlined Model "80" is ideal for use in close quarter work where the usual ½" drill cannot get in. Just right for maintenance drilling. Powered for constant production work on metals. Capacity in steel, ½"; in hard wood, 1¼". No-load speed 450 R.P.M.; full load 300 R.P.M. Equipped with ½" capacity 3-jaw Jacobs chuck and key; 7 ft. 3-conductor cord and connector; detachable pipe handle. Standard voltage 115, D.C. or A.C.

MODEL "80" ..... **each $48**

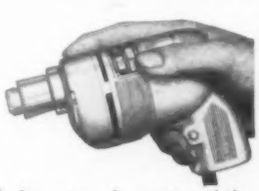
SKILDRILL MODEL "64"—⅜" Heavy Duty

Perfect for production or maintenance drilling of ⅜" holes in all metal. Like Model "80," excellent on close-quarter drilling. Capacity in steel ⅜"; in hard wood 1". No-load speed 750 R.P.M.; full load 475 R.P.M. Net weight 8 lbs. Length overall 11¼". Equipped with ⅜" capacity 3-jaw Jacobs chuck and key; 7 ft. 3-conductor cord and connector, detachable pipe handle. Standard voltage 115, D.C. or A.C.

MODEL "64" ..... **each $48**

SKILDRILL MODEL "45"

¼" Constant Duty



SkilDrill puts a world of drilling power right in the palm of a man's hand . . . for fastest drilling in even the tightest spots. Only 6⅝" long. Weighs just 2¾ lbs. Ideal for aircraft, automobile, refrigerator, radio, tank and other drilling. Capacity in steel ¼"; in hard wood ½". No-load speed 1800 R.P.M.; full load 1050 R.P.M. 2500, 3500, 5000 R.P.M. no extra cost. Slow speeds 500, 750, 1000 R.P.M. $5.50 extra. Equipped with ¼" 3-jaw Jacobs chuck and key; 7 ft. 3-conductor cord and connector. Standard voltage 115, D.C. or A.C.

MODEL "45" ..... **each $32.50**

SKILDRILL MODEL "47"—¼" Heavy Duty

Similar to Model "45" but *even more powerful . . . even greater drilling speed under load.* Capacity in steel ¼"; in hard wood ½". No-load speed 1800 R.P.M.; full load 1270 R.P.M. 2500, 3500, 5000 R.P.M. no extra cost. Slow speeds 500, 750, 1000 R.P.M. $5.50 extra. Net weight 3¼ lbs. Length overall 7¼". Equipped with ¼" capacity 3-jaw Jacobs chuck and key; 7 ft. 3-conductor cord and connector. Standard voltage 115, D.C. or A.C.

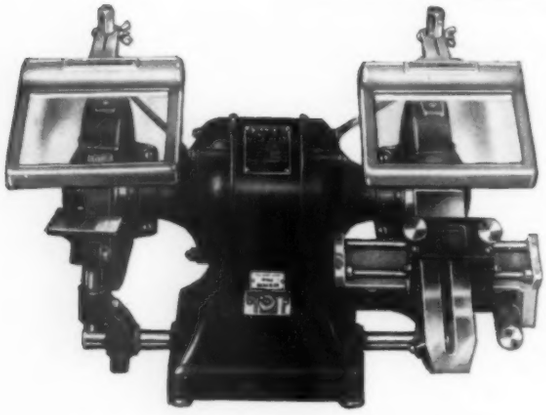
MODEL "47" ..... **each $36**

BRANCHES IN ALL PRINCIPAL CITIES

STANLEY ELECTRIC TOOLS

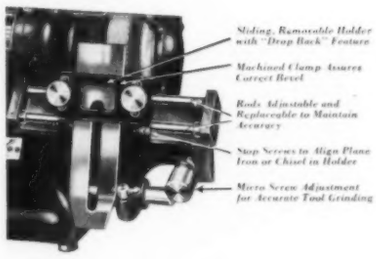
EDUCATIONAL DEPARTMENT

New Britain, Connecticut



No. 677 EDGE TOOL GRINDER

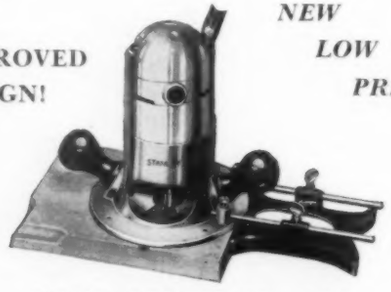
Every wood-working shop needs this improved, full ball bearing Bench Grinder. Powered by a ⅓ H.P. induction motor, fully enclosed, it operates at the correct speed for edge tool grinding. Equipped with "Flud-Lite" Eye Shields, one Adjustable Tool Rest, and the Plane Iron and Chisel Grinding Fixtures.



PLANE IRON AND CHISEL GRINDING FIXTURE

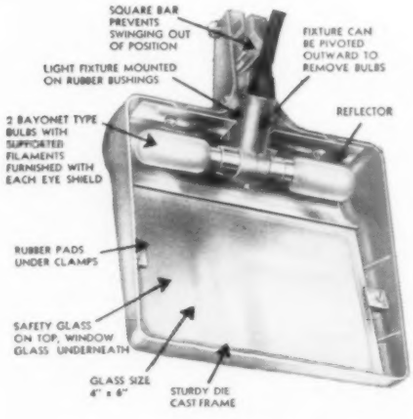
Standard equipment with the No. 677 Grinder, keeps edge tools accurately beveled. Takes plane irons up to 2⅝" wide and chisels of any size. Micro screw feed adjustment.

IMPROVED DESIGN! *NEW LOW PRICE!*



HAND ROUTER No. 10A

Fast—18,000 R.P.M.—assuring a smooth finish that makes sanding practically unnecessary. For Shaping, Inlay Work, Routing, Templet Work, Veining, Grooving, Rabbeting, Corner Beading, etc. The power unit may also be quickly attached to a Beading and Fluting unit or to a shaper table. Provides a great variety of practical cuts and a wide range of decorative operations at a very low cost.



STANLEY "FLUD-LITE" EYE SHIELD No. 600

Effective eye-protection combined with better vision. Two light bulbs with reflectors floodlight work area, help prevent injuries. Adjustable up and down, and tilts to suit operator's position. Cannot be moved to non-guarding position without dismantling. Standard equipment on No. 677 Grinder, as shown above. Can be attached to all similar bench or belt-driven grinders.



BE SURE YOU HAVE THESE STANLEY CATALOGS

No. 67 STANLEY ELECTRIC TOOL CATALOG

Describes and illustrates the complete line of Stanley Electric Drills, Saws, Unishears, Grinders and other tools. Write for a copy.

No. 607 ROUTER-SHAPER CATALOG

Describes Stanley Router-Shapers, and all the various attachments and applications. Keep a copy on hand for reference.



BROWN & SHARPE MFG. CO.

Providence 1, R. I.

"World's Standard of Accuracy"

CONVENIENT, VERSATILE MACHINES OF PRECISION CONSTRUCTION



MILLING MACHINES

Universal — Plain — Vertical
including toolroom and
manufacturing types
(No. 2 Light Type Universal shown)





GRINDING MACHINES

Universal — Plain — Surface
—Cutter and Tool
(No. 2 Universal shown)

SCREW MACHINES

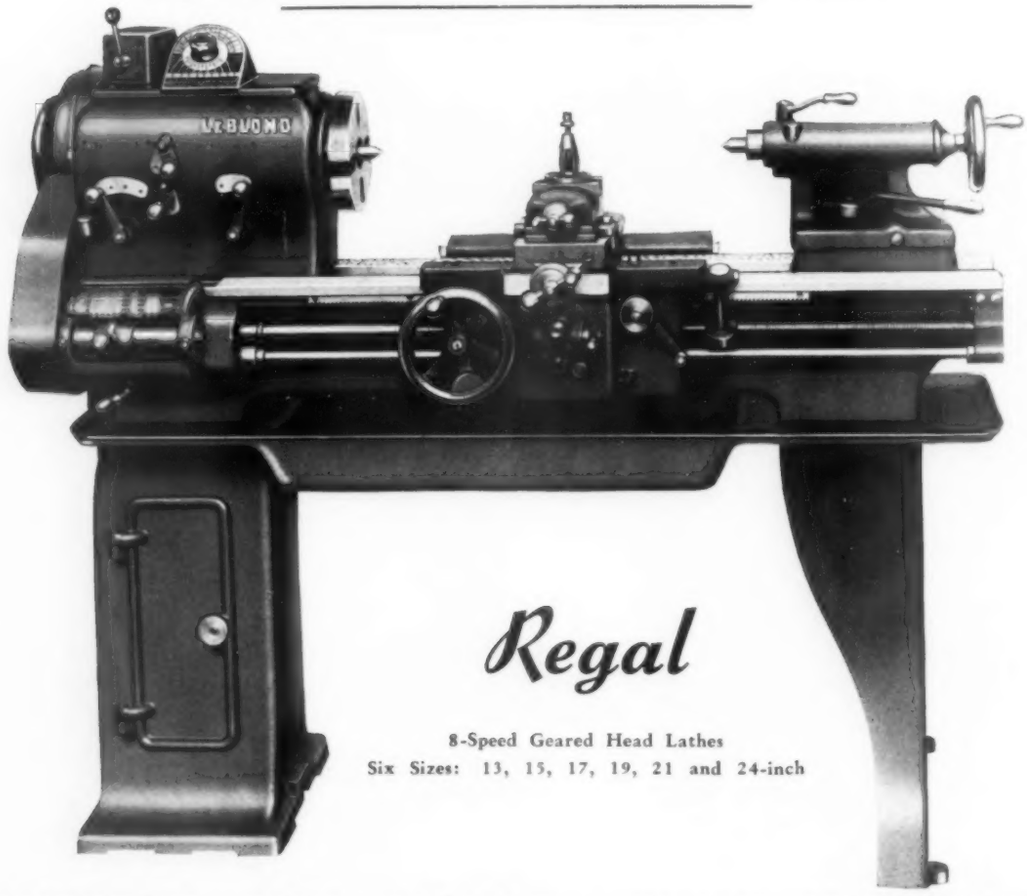
Automatic
—Wire Feed (Semi-Automatic)
(No. 2 Wire Feed shown)

Detailed Specifications on machines of any size or type sent on request

THE R. K. LeBLOND MACHINE TOOL CO.

Cincinnati 8, Ohio

Largest Manufacturer of a Complete Line of Lathes



Regal

8-Speed Geared Head Lathes

Six Sizes: 13, 15, 17, 19, 21 and 24-inch

ENGINEERED FOR SCHOOL SHOP INSTRUCTION

At a price far below the LeBlond heavy duty lathes of general industry, the Regal has all the important *big lathe* operating principles *plus* special features for instruction.

FEATURES—New Rapid Speed Selector to indicate correct RPM in relation to material and diameter. Selective Geared Headstock—8 speeds—steel gears throughout—reverse to leadscrew, feed rod and compounding gears entirely within headstock. One-piece Apron—box type—rack pinion and hand-wheel on ball bearings—moving parts submerged in oil—one-shot lubrication to apron, carriage ways and cross slide. Geared Feed Merhanism—foolproof—with both leadscrew and feed rod—automatic resetting safety device prevents undue strain on rod and feed mechanism. Bed—Inverted V-type—exceptionally heavy—cross girths at close intervals to resist twist and torsional strains. Multiple Disc Clutch and Brake—for quick start and stop furnished as regular on 21" and 24" sizes—extra on 13", 15", 17" and 19".

TURRET LATHES—Regals equipped with ram type bed turrets now available in 13", 15", 17" and 19" sizes, for speeding up chucking operations. Turret is easily removed to permit change to regular tailstock—Power or hand feed.

GAP BED TYPE—It is often necessary to use a large lathe to swing a piece of work—while the actual machining operation can be handled by a lathe of smaller swing. For this purpose the Regals (except the 13" and 15" sizes) can be furnished with a gap bed. All the improvements and labor-saving devices of regular machines are retained.

STANDARD EQUIPMENT—Reversing type motor, vee belt motor drive complete, motor control switch. Also large and small face plates, steady rest, follow rest, graduated compound rest, tool post, collar and wedge for same, taper spindle sleeve, adjustable thread cutting stop, centers and necessary wrenches, foundation plan, instruction book, lag screws and washers.

REGAL SPECIFICATIONS

SIZE	13"	15"	17"	19"	21"	24"
Swing, in.:						
Over Ways	13¼	15¼	17¼	19¼	22¼	25¼
Over Carriage and Taper Attach.	8¼	10	10½	12	13½	17
Centers,* min., in.	18	18	30	30	36	36
Spindle Speeds:						
Number	8	8	8	8	8	8
Range, r.p.m.†	25-500	25-500	20-425	20-425	14-350	15-350
Feeds:						
Number	48	48	56	56	63	63
Range, in.	.0025 to .143		.001 to .125		.0027 to .333	
Threads, per in.	4 to 224		1½ to 184		1 to 120	
Net Weight with Motor, lbs.**	1045	1240	1985	2560	4150	4495

* Increasing in increments of 6 inches on 13" and 15" and 12 inches on 17" to 24" sizes.

† Speeds shown can be increased 50% for tungsten carbide tools.

** Approximate, with minimum center-to-center dimension.

LOGAN ENGINEERING COMPANY

4901 Lawrence Avenue, Chicago 30, Ill.

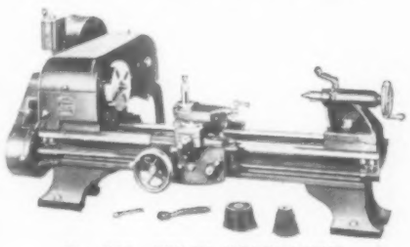
FOR SCHOOL WORK SHOPS, TOO, IT'S

Logan

A Name to Remember When You Think of BETTER Lathes



No. 200 SCREW CUTTING LATHE



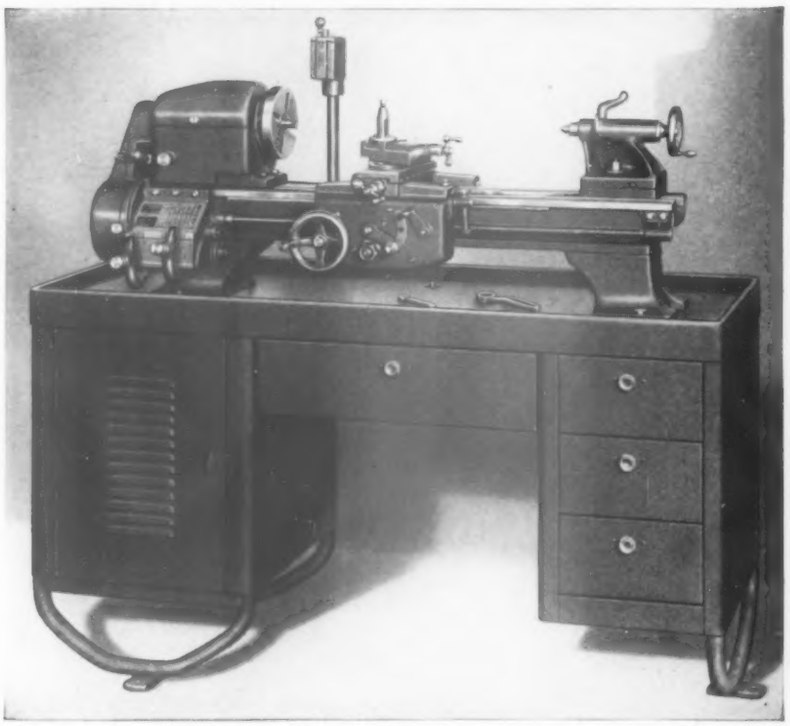
No. 210 BENCH MODEL LATHE



No. 820 QUICK CHANGE GEAR LATHE

SPECIFICATIONS COMMON TO ALL LOGAN LATHES

Swing over bed, 10½" . . . bed length, 43⅛" . . . size of hole through spindle, $\frac{25}{32}$" . . . spindle nose diameter and threads per inch, 1½"-8 . . . 12 spindle speeds, 30 to 1450 rpm . . . motor, ½ hp, 1750 rpm . . . ball bearing spindle mounting . . . drum type reversing motor switch and cord . . . precision ground ways, 2 V-ways and 2 flat ways.



No. 825 QUICK CHANGE GEAR CABINET LATHE

The characteristics which have brought Logan Lathes into industrial prominence also make them effective training machines. The degree to which these lathes combine versatility, speed, sustained accuracy, rugged strength and safety explains why they are being installed in ever increasing numbers in the shops of leading engineering schools, manual training schools, and high schools. Typical Logan advanced design features are a pre-loaded, grease-sealed ball bearing spindle mounting . . . a rugged, warp-free bed with its ways ground to within .0005" of parallelism . . . self-lubricating bronze bearings where ordinary plain bearings are usually furnished . . . three-point suspensioning and rubber cushioning of the countershaft for extra smoothness and freedom from vibration . . . and completely enclosed design which not only shields the lathe, but also protects fingers and clothes from moving belts and gears. With all these advantages, Logan prices are within the range of the moderate school budget.

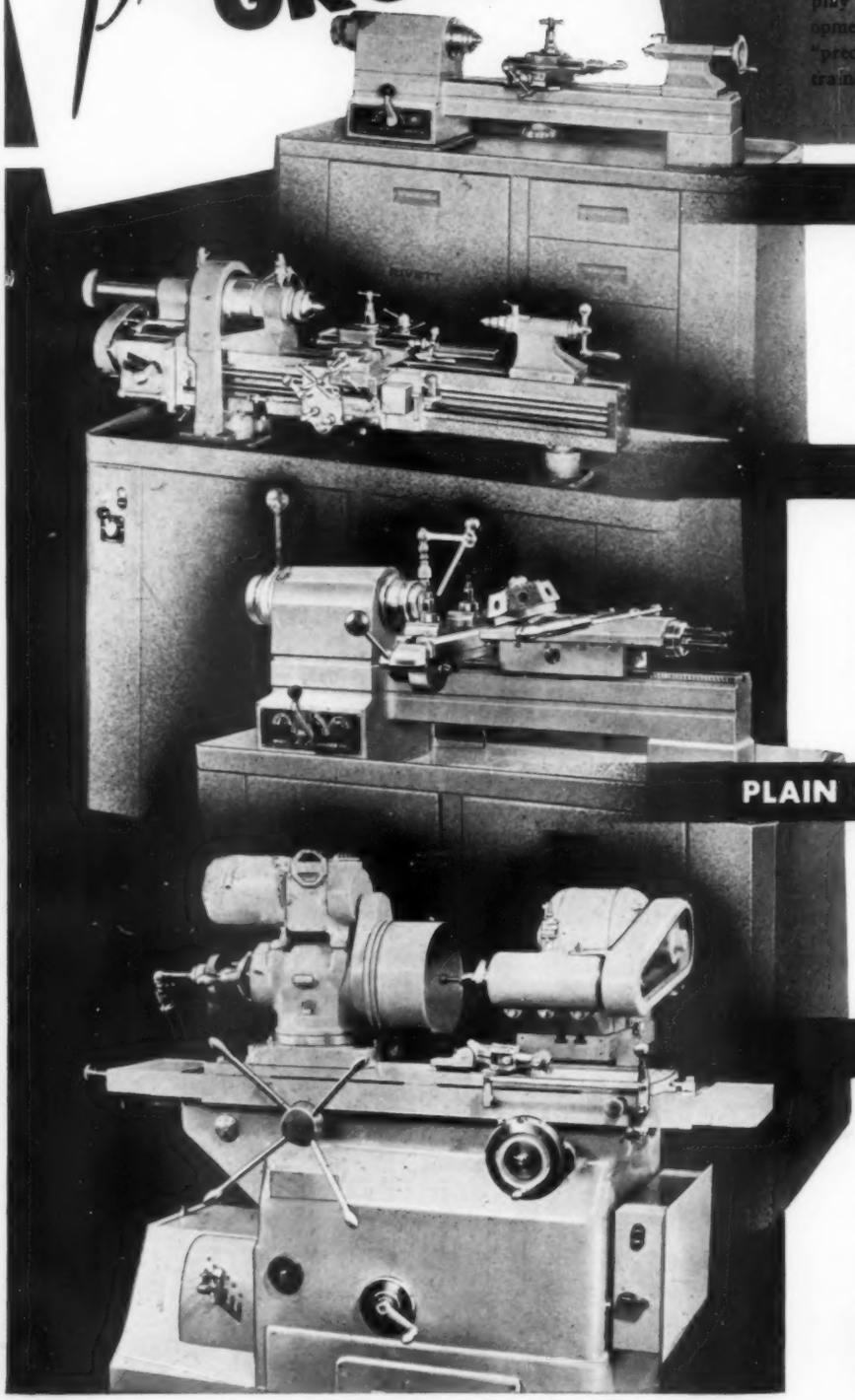
CATALOG DESCRIBING ALL MODELS OF LOGAN SCREW CUTTING LATHES, TURRET LATHES AND HAND SCREW MACHINES IS AVAILABLE ON REQUEST

RIVETT LATHE & GRINDER, INC.

Brighton, Boston, Mass., U. S. A.

PRECISION *Proving* GROUND

What tool maker or master mechanic can forget the exacting problems of his instructor — how he mastered seemingly impossible tolerances with the aid of a Rivett lathe or grinder? Many a scientist and engineer acknowledges the part these machines play in his research and new product development. Rivett is proud of their service as "precision proving grounds" for both the trainee and the producer.



PLAIN CABINET LATHES

An engineered unit, quick to set up, with power, wide speed range, and vibrationless performance; capable of many jobs often produced on heavy, costly, machines. No. 715: swing: 7" dia.; center distance: 15"; collet cap.: ¼" max.: No. 918: swing 9" dia.; center distance: 18"; collet cap.: 1" max.

TOOL ROOM LATHES

No. 608 back-geared, screw cutting, precision lathe for production of fine work. It will handle a great variety of parts in minimum time. Finely made attachments for milling, spiral cutting, slotting, relieving, taper and ball turning, grinding, forming, and multiple operations are available. Swing 8½" dia.; center distance 18¼"; collet cap.: 1" max.

PLAIN CABINET TURRET LATHES

No. 918 an efficient producer on small duplicate parts. In combination with six turret operations, double tool cross slide can be furnished for straight and taper turning, forming or cutting-off. Swing 9" dia.; collet cap.: 1" max.

INTERNAL GRINDERS

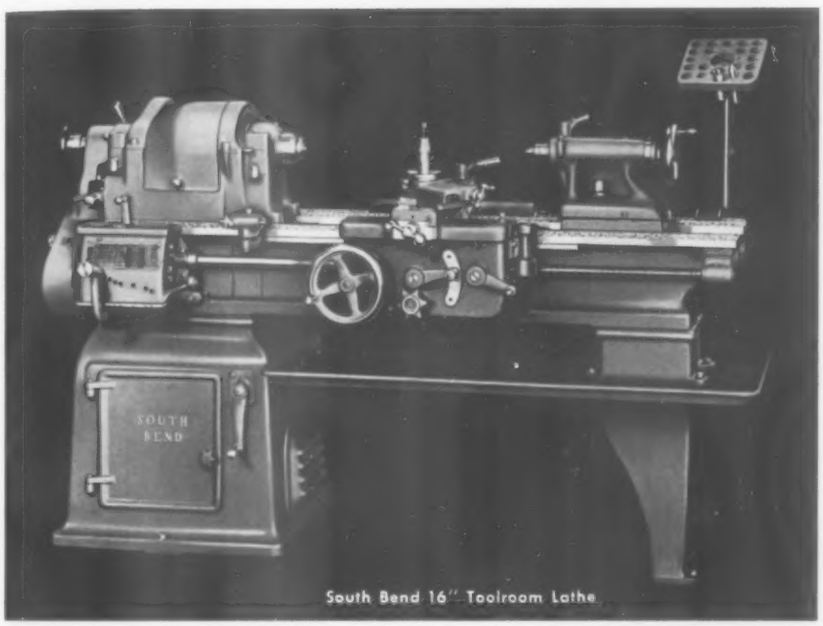
Primarily for tool room work requiring wide variety of operations. Attachment for external grinding. Fine table feed with micrometer stop for shoulder and face grinding. In two sizes: No. 112, grinding cap. up to 8" dia.; table travel up to 8". No. 104, grinding cap. up to 3" dia.; table travel up to 4".

RIVETT

SOUTH BEND LATHE WORKS

473 E. MADISON STREET SOUTH BEND 22, INDIANA

Lathe Builders Since 1906


South Bend 16" Toolroom Lathe

TYPES AND SIZES OF SOUTH BEND LATHES

Engine Lathes and Toolroom Lathes

9" swing—
3', 3½', 4', and 4½' bed lengths

10" swing—
3', 3½', 4', and 4½' bed lengths

13" swing—
4', 5', 6', and 7' bed lengths

14½" swing—
5', 6', 7', 8', and 10' bed lengths

16" swing—
6', 7', 8', 10', and 12' bed lengths

Turret Lathes

Series 900—½" collet, 9" swing
Series 1000—1" collet, 10" swing

The wide use of South Bend Lathes in industry, for production and toolroom work, makes them highly effective for training purposes. Because students acquire skill on the same lathes they are likely to use in their work, they become better workers in less time.

Their ease of operation, safety features, accuracy, and ruggedness have long made South Bend Lathes popular with both shop instructors and students. There is a South Bend Lathe for practically every type of training from elementary shop to advanced tool and die work. For full information, write for your copy of Catalog 100-D.


South Bend 13" Toolroom Lathe

TEACHING HELPS FOR SHOP CLASSES

To aid the training of new lathe operators, we have made available a comprehensive selection of proven teaching helps. These include books, free loan 16 mm. sound films, wall charts and booklets on lathe operation and care. Full information on obtaining this material can be had by writing for Bulletins 8-A and 21-E.

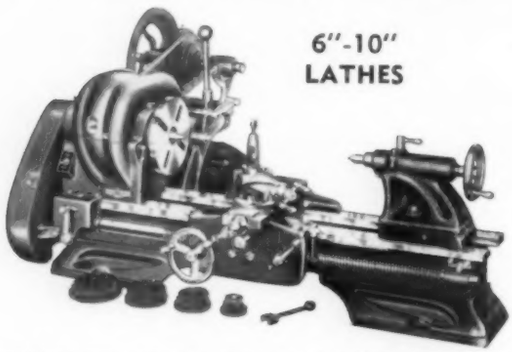



South Bend 9" Bench Lathe

ATLAS PRESS COMPANY

1890 N. Pitcher Street, Kalamazoo 13D, Mich.

PROVIDE MORE PUPIL STATIONS AT LOWER COST with *Atlas* TOOLS



6"-10" LATHES

Everything you need for training in lathe operation and care is embodied in Atlas 10" lathes. They are back-geared screw-cutting lathes with automatic cross-feed, Timken-bearing equipped, designed to maintain precision through years of use.



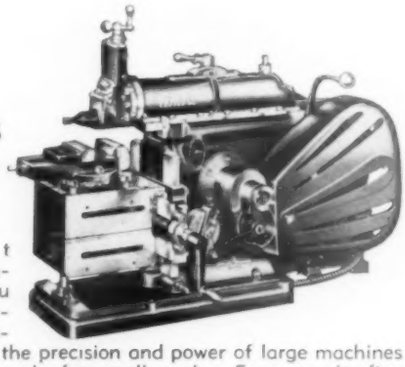
DRILL PRESSES

Available in both bench and floor models. Nine speeds. The exclusive spindle design provides exceptionally smooth operation—assures precision work and long service.



MILLING MACHINES

Ideal for quick training in every fundamental milling machine operation without a large investment. Timken bearing equipped. Ruggedly built.



SHAPERS

At low cost these 7" shapers help you provide complete shaper instruction. All the precision and power of large machines built down to scale for small work. Four speeds, five automatic cross feeds.

AS AMERICA ENTERS a new age of mechanical - electronic progress, schools face growing demands for *better* industrial arts training, for *more* students. Shop supervisors are trying to raise standards and at the same time accommodate increasing enrolments. They face the problems of inadequate equipment budgets and crowded shop conditions.

VALUABLE TEACHING AIDS

Atlas' set of five large blue-print type wall charts—with technical data for various machine tools and machining operations—sent postpaid for 25 cents. Complete lathe operation manual, $.85.

Atlas tools *economically priced and compactly designed,* help you solve both problems and provide more pupil stations. Even in shops that seem crowded to capacity there are usually several spots where Atlas tools can be located.

Atlas precision and ease of operation, praised by industrialists, will encourage your students to develop accuracy while learning every basic machining function. Send for catalogs with full data specifications on Atlas tools at prices that help you stretch your shop equipment budget to the limit.

Atlas
ATLAS PRESS CO.
KALAMAZOO, MICH.
U.S.A.

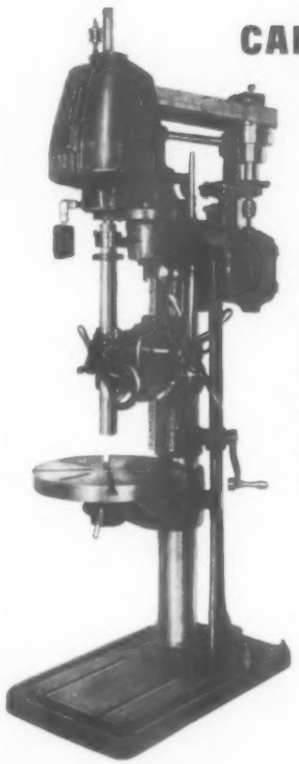
CANEDY-OTTO MANUFACTURING CO.

Manufacturers of Precision Equipment Since 1892

General Offices and Factory: Chicago Heights, Illinois

New York Branch: 407 Broome Street, New York City

CANEDY-OTTO DRILLING — PRECISION BUILT UNITS



C.O. 21" Sliding Head *Motor Driven* Floor Drill

This general-purpose floor drill is an outstanding value for the machine shop: sturdily constructed, full anti-friction bearing equipped, precision built. Spindle, table and base retain perfect alignment throughout years of use. Available with geared power feed and back gears, or with lever feed only. Drilling capacity in cast iron 1½".



C.O. No. 16 Royal Bench Drill *Motor Driven*

Meets the most exacting requirements, producing accurate work at minimum cost. Primarily designed as a metal working tool it is also adaptable to wood working; can be used for sanding, mortising, grinding and routing. Drills holes up to ½ inch, to center of 16¼ inches. Five speeds: 5200-2835-1632-917-460 r.p.m.; with slow speed pulley, 385-732-1240-1950-3110 r.p.m. All ball-bearing equipped.



C.O. No. 18 Royal Floor Drill *Motor Driven*

This general-purpose sensitive drill, also designed for producing accurate work at minimum cost, has drilling capacity in cast iron of ¾-inch with ½-hp. motor, 1800 r.p.m.; ⅞-inch with ¾-hp. motor, 1800 r.p.m.; and 1 inch with ¾-hp. motor, 1200 r.p.m. Six speeds. Full ball-bearing equipment.

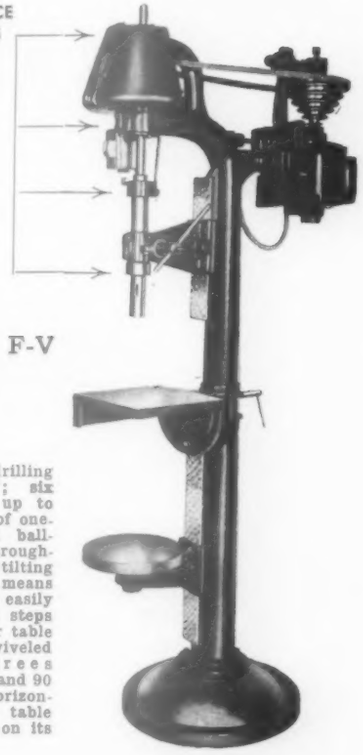
Write for illustrated bulletins



C.O. No. 21" Stationary Head "V" *Belt Motor Driven* Drill

This drill is particularly adaptable for automobile repair shops, as the height, distance from spindle to table and base, and general range, permit its use for cylinder reboring of any type or size of internal combustion motor. The brace, or supporting arm, gives additional support and strength for capacity drilling. With the back gear, 8 speeds are obtained. Drills to center of 21" circle, from 0 up to 1½ inches.

4 BALL RACE BEARINGS



C.O. 14" 3000 F-V *6-Speed Sensitive* Floor Drill

This drill has a drilling capacity of ⅝"; six speeds, from 345 up to 3205 r.p.m.; frame of one-piece casting, full ball-bearing equipped throughout; exclusive C-O tilting motor bracket, by means of which the belt is easily changed to various steps of the pulley; upper table capable of being swiveled through 360 degrees around the column, and 90 degrees from its horizontal position; lower table capable of rotating on its axis.

PORTER-CABLE MACHINE CO.

3000 N. Salina Street, Syracuse 8, New York

REPRESENTATIVES IN PRINCIPAL CITIES — See Classified Telephone Directory

TEACH *your* Classes on Industry's Own Tools

PORTER-CABLE

Prepares the Student for an Important Job in:

- MACHINE SANDING
- POWER HANDSAWING
- BELT MACHINING
- FLOOR CONDITIONING

● Effective vocational training must prepare the student to use the tools of industry! Porter-Cable Belt-Surfacers—Wet or Dry, Speedmatic Saws, Speedmatic Floor Sanders, Take-About Dustless Sanders—these are the tools that dominate their fields! Experience on industry's own machines is a quick passport to a good job for the students who will look to you for guidance next Fall. Modern vocational training is serious business, and deserves the machines of business. If you would like to know more about Porter-Cable Tools—we'll send you the literature we send to industry—to enable you to start the pupil right!

● YOUR BOARD WILL BE GLAD TO KNOW. Your school board will be glad to know that these tools can be put to productive use in your own shops! For maintenance work of all kinds—to finish desks or blackboards—to sand floors—to fit sash and doors—or to help out on light construction work —these Porter-Cable Tools are industry's own! Your Board will be quick to see the double value of training equipment that's also unexcelled for maintenance. ASK FOR LITERATURE — THE SAME WE SEND TO INDUSTRY!

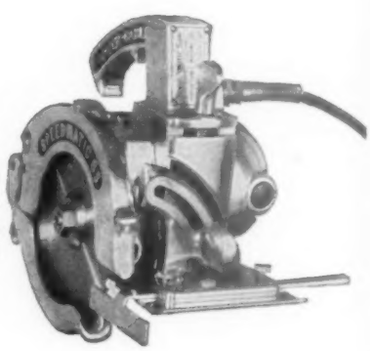


G-8 WET-DRY BELT SURFACER

Wartime production schedules have demanded the introduction of this equipment in any factory with a surfacing problem. You can't prepare a student better than on this universally accepted machine. It's vital to the fast-growing plastics industry!

Speedmatic SAWS

This is the tool that has enabled the building industry to keep abreast of technological advances elsewhere!





Speedmatic FLOOR SANDER

Floor finishing, through the use of this machine, has become faster, better, and easier. It's in use wherever floors are finished!



G-4 BELT SURFACER

For versatility, and introduction to production technique, here's industry's all-around tool. For surfacing and fast finishing of small parts!

TAKE-ABOUT

THE DUSTLESS SANDER

From the home workshop to the greatest factory — this light, dependable sander is speeding up work requiring the finest finish!



WALKER-TURNER CO., INC.

2245 Berckman St. Plainfield, N. J.

Machine Tools for Metals, Plastics and *Other Materials*

Drill Presses · Radial Drills · Metal-Cutting Band Saws · Metal Cut-Off Machines
Motor Grinders · Flexible Shaft Machines

Walker-Turner Machine Tools are practical industrial production machines, ideally suited to school and vocational training because their efficient, simplified design makes them easy to operate, therefore more quickly mastered by beginners. Each machine is compactly constructed—amply safeguarded—accurate in operation.

Because these Walker-Turner Machine Tools are exactly the same as those supplied by the thousands to vital war industries, there has been no need for expensive reconversion to post war use. The streamlined Walker-Turner plant continues to produce in large volume—an important factor in keeping prices within the scope of school budgets.

WALKER-TURNER DRILL PRESSES

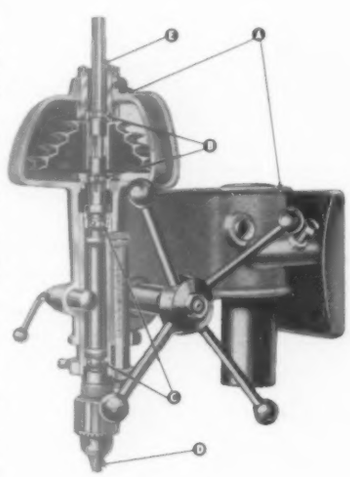
These 15″ Drill Presses are available in several bench and floor models, all incorporating the efficiently designed Drill Head features shown at the right, which provide highly accurate spindle operation. Made of finest materials, built to precision standards, Walker-Turner Drill Presses are easily operated, stand up under continuous use.

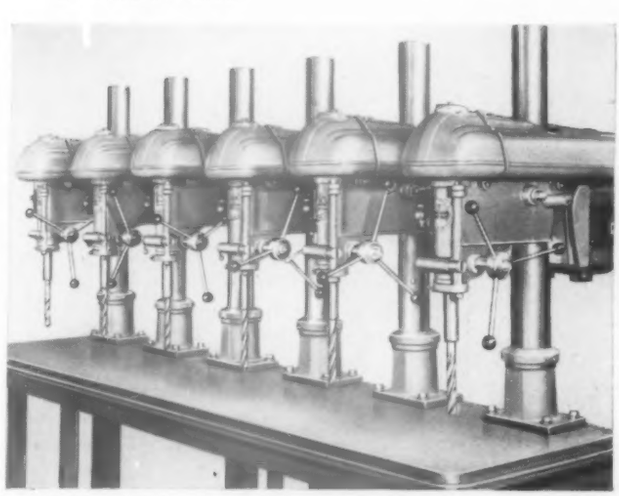


SPECIFICATIONS: Standard spindle speeds, with 1740 r.p.m. motor, 600, 1250, 2440 and 5000 r.p.m. Calibrated depth stop, positive locking device, 4-spoke pilot wheel feed, columns precision ground. Spindle travel, 4¼″. Chuck to table, 12″; chuck to column, 7½″; drills to center of 15″ circle. Bench model, 39½″ high, 10″ wide, 25″ deep. Floor models, 69″ high, 25″ deep. Foot feed available.

DRILL HEAD CONSTRUCTION

A. One-piece head casting, precision bored to assure correct bearing alignment.
B. Bearings above and below drive pulley take strain evenly, eliminating spindle "whip."
C. Precision deep-groove bearings, with thrust taken by upper bearing.
D. Jacobs chuck for maximum accuracy.
E. A few drops of oil placed in cap will lubricate entire spindle and all four bearings. Lowest bearing sealed against dirt, dust and particles.





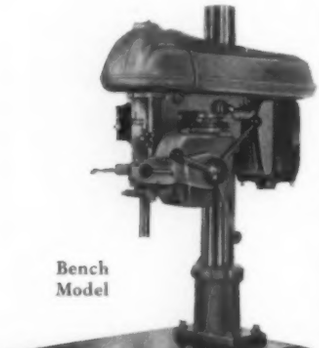
MULTIPLE SPINDLE MODELS (Right)

Walker-Turner Drill Presses are available in 2, 4 and 6 spindle models. Shown herewith is a battery of six 20″ Drill Presses in line for group operation.

20 inch POWER FEED DRILL PRESSES

These drill presses have a compact, smooth-acting power feed unit, driven from the drill press spindle. It operates with a clutch and engages at any point, regardless of spindle position. An automatic, positive release assures holes of uniform depth. Adjustments are quickly made. Operator simply pushes the convenient lever, and drilling or tapping operation completes itself automatically.

May also be operated by the hand feed, which provides sensitive control. Especially valuable for beginners, trainees and inexperienced help. Walker-Turner 20″ Power Feed Drill Presses are available in bench, floor and four spindle models.



Bench Model

SPECIFICATIONS

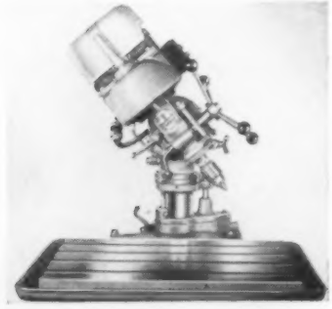
Drills to the center of a 20″ circle. Drills holes up to 1″ in cast iron. ¾″ in steel. Four feeding speeds: .003″, .006″, .009″ and .012″ per spindle revolution. Drilling speeds from 260 to 5200 r.p.m. Spindle travel, 6″. Distance spindle to column, 10″. Column, 3¾″ diameter. Ten spline spindle. SKF bearing equipped.



Floor Model

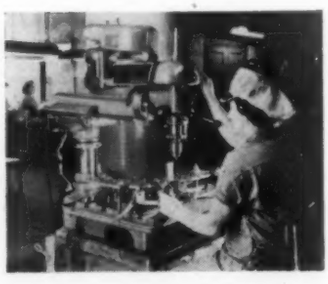
RADIAL DRILL

An extremely versatile, speedy, accurate Radial for drilling, tapping, routing and light profiling. Does much of the work of radials costing 5 to 6 times as much. Very easily operated, its accuracy is well within all industrial and commercial tolerances. Drill head, ram and cradle are raised and lowered by crank-operated screw mechanism at top of column. Overall height, with base, 68½″ maximum traverse of ram, 18″. Distance nose of chuck to table, 16½″. Sixteen spindle speeds from 160 to 8300 r.p.m. with 1740 r.p.m., ½ H. P. motor. Jacobs Chuck, 0 to ½″ or No, 1 Morse Taper. Machined Table surface, 28″ x 19″.



Left: **Head tilts 45° right or left**

Right: **Showing wide range, which permits drilling to center of 62″ circle**





TILTING ARBOR SAW

For greater utility and convenience this 10″ Tilting Arbor Saw incorporates several exclusive features. A magnetic overload protection switch positively eliminates injury to motor due to overloading. The Vernier adjustment of the ripping fence is regular equipment. Convenient fence locking lever releases or locks the ripping fence in less than a half turn. The gun-type elevating mechanism is simple and strong and can not be jammed.

New tilting assembly, perfectly balanced and so designed that it can not be sprung or twisted out of alignment. Full 3″ depth of cut, angle cuts to 45°; through 2″ stock on level table. Plenty of room in front of blade. A sturdy, accurate, dependable shop tool.

JOINTERS

On ordinary jointers, the guard simply swings over the knives for protection. But the guard on this 6″ De Luxe Model Jointer performs a double function. It has been so designed that the work may be fed under it while the operator's left hand, resting on the guard, applies the necessary amount of pressure. Wood can be planed down to ribbon thickness, with absolute safety. And, by feeding the strip between the fence and the curved, inner edge of the guard, thin narrow strips may be planed down to practically nothing.

Texrope drive with triple V belts permits highly efficient, close-coupled motor connection. Hinged fence is equipped with quick-action release lever. Heavy, accurately machined table mounted on dovetail ways with adjustable gibs. Approved 3-knife cutterhead.



10-INCH GRINDERS



The Motor is fully enclosed, and specially designed seals prevent the entrance of dust into ball bearings. The motor end bells are extended, allowing use of both sides of grinding wheels.

Wheel guards are of heavy construction with removable covers to provide ready access to the wheels.

Tool rests are rigidly mounted on steel bars which extend from the base. Every necessary adjustment is easily made.

Two vitrified wheels (one fine grit, one coarse grit, both 10″ diameter by 1″ face x ¼″ shaft bore) supplied as standard equipment.

Eye shields (optional) are of approved type of shatter-proof glass, containing glareless lights for work illumination.

GR100 with 1 H.P. 3 phase, 60 cycle 1725 r.p.m. motor, or 50 cycle 1500 r.p.m. motor

Base (optional) is of heavy cast iron. The top provides convenient tray for tools as well as reservoir for cooling water.

Walker-Turner Machine Tools are stocked by distributors in all principal centers, who will be glad to give you full information on any machines or to demonstrate them in their showrooms. Write for name of nearest distributor. Complete catalog of Walker-Turner Machine Tools sent upon request.

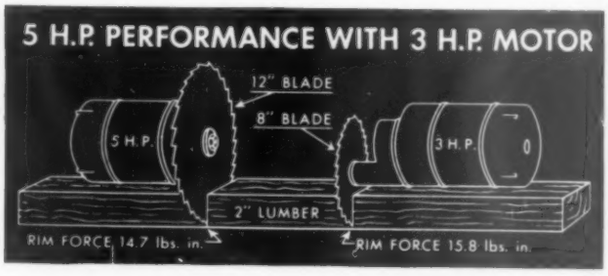


METAL CUT-OFF MACHINE

This machine utilizes the "transverse travel" method, which permits cutting wide, flat materials, bulky pieces and many different shapes of ferrous and non-ferrous metals, ceramics and plastics. Gliding ram mounted on 8 precision ball bearings provides finger-touch control. Head operates in many positions, affording wide usefulness. Height, with steel stand, 61″; floor space 4 ft. x 5 ft.; ram travel, 21½″; vertical adjustment, 8½″; working table, 17″ x 45″.

PATENTED, GEARED, SHOCKPROOF MOTOR

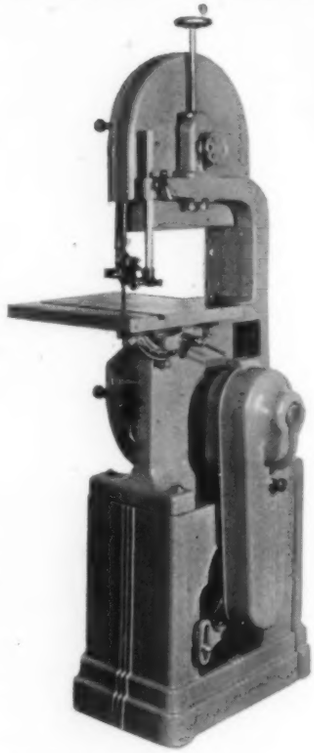
This motor gets the shaft closer to the work, thus smaller wheels, with greater rim force, may be used.



This also permits the use of smaller motors, giving 5 H. P. performance with a 3 H. P. motor. The motor has a "mechanical cushion" in the gears, to protect gear teeth against breakage under shock loads. Automatic resetting.

METAL-CUTTING BAND SAWS

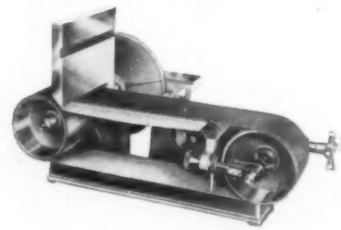
These Band Saws have back-gearing and cone pulleys, similar to those on a screw-cutting lathe, providing wide speed range for cutting or trimming die steels, ferrous and non-ferrous metals, wood, plastics, almost any material. Widely used throughout the war industries. Blade tensioning devices minimize blade breakage. Guards completely protect operator. Heavy cast - iron, one - piece frame for extra strength and rigidity. Available in 14″ and 16″ models.



SPECIFICATIONS

Speed range from 60-5300 f.p.m. Dimensions: 16″ MODEL, overall height, 71½″, width, 30½″, distance front to back, 22″, table size, 17″ x 18″, blade to frame, 16″, guide to table, 12″. 14″ MODEL, overall height, 65″, width, 25¾″, distance front to back, 20″, table size, 16″ x 16″, blade to frame, 14″, guide to table, 7″. Tables tilt 45° one direction, 5° the other.

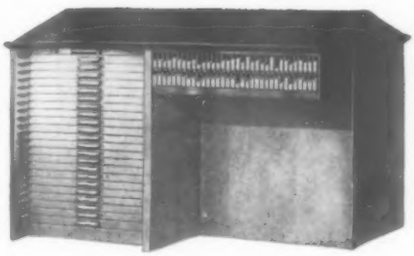
BELT AND DISC SURFACER



This handy, two-in-one machine has a sanding disc 10″ in diameter and a sanding belt 4″ x 52½″. Belt tension is varied by a cushion spring control. The sanding table under the upper section of the belt is 12″ x 4¼″. The 12″ x 6″ disc table tilts from 90° to 45°. Belt operates at 1050, 1760 and 3100 s.f.m.; disc at 765, 1350 and 2275 r.p.m. Available in table and floor models.

AMERICAN TYPE FOUNDERS

Education Department 200 Elmora Avenue, Elizabeth B, New Jersey



No. 12013-D American Standard
School Type Cabinet



26½" C & P
Hand Lever Paper Cutter



EHFS Boston Heavy
Duty Stapler



10x15 New Series C & P
Platen Press

NOW *Everything*

for the SCHOOL PRINTING DEPARTMENT

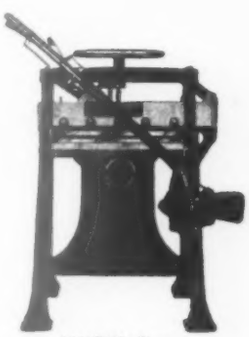
School executives who have been planning to install a printing and graphic arts department . . . are assured of complete service and sound, practical help from ATF.

ATF *Complete Service* means more than supplying needed equipment . . . it also includes expert advice on layout and operation of a school printing department. ATF's qualifications are derived from nearly half a century of experience installing hundreds of commercial plants and school printing departments in thousands of Junior and Senior High Schools, Vocational Schools and Colleges.

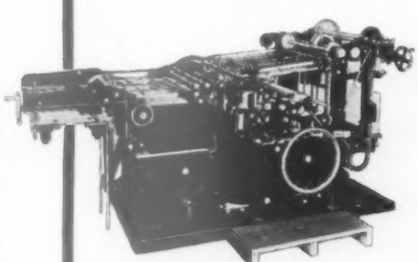
This broad background of experience is freely available to you . . . in addition to helpful literature on important phases of school printing and graphic arts departments, such as:

Booklets: *"Graphic Arts, the Foundation of a Liberal Education"*
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Also available is a series of illustrated folders with suggested floor plans and complete lists of needed equipment for school printing departments of varying capacities. *Send for your free copies today.*



26½" Challenge
Hand Lever Paper Cutter



C Kelly Automatic Cylinder Press



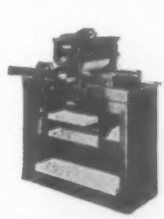
ATF Chief 22 Offset Press



ATF-Pratt
Hand Bookbinding
Unit



No. 2 Vandercook Proof Press



No. 1425-C Challenge
Proof Press

ATF types used: Stencil, Brush, Spartan Black, Bodoni

THE NEW BRITAIN MACHINE CO.

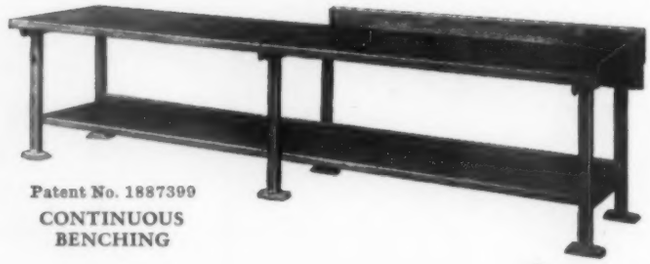
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STEEL TOP WORK BENCH No. 1901

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A Complete Line of FINE HAND TOOLS

● More than half a century of precision manufacturing backs this famous Line. Over 1200 standard items including hundreds of specialized Hand Tools the School Shop finds practical and which encourage good workmanship. Ask for the new full line Catalog No. 56M which illustrates and describes these fine Tools in its 15 fully illustrated sections.





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Chicago rack and cabinet type clothes dryers are available in various sizes and types for every need. The size and type most suitable for your needs depends on the purpose for which dryer will be used, capacity required, space available, and the type of heat desired. All dryers are available for operation on gas, steam or electric heat. Cabinet and rack type clothes dryers are ideal for use in dormitories, domestic science rooms, athletic departments, etc. Dryers can be furnished for recess installation if desired. Standard exterior finish is baked gray enamel or baked white enamel, unless otherwise specified. The casings of dryers are of galvanized sheet metal with sturdy steel framework. When specified, casings can be made double thickness with asbestos insulation. Gas heated dryers are equipped with steel heating drum and indirect heating system, so no flame is exposed, and equipped with adjustable A.G.A. type gas cocks and improved heating system for rapid drying. Steam heated dryers are equipped with heating coil mounted at bottom of dryer. Recommend operation on medium or high pressure steam for rapid drying. Electric heated dryers are equipped with heaters mounted at bottom of dryer. On rack type dryers, current consumption is 1½ KW per rack. Standard electric heating elements for operation on 208/220/230 volts. Electric dryers may be equipped with thermostats and automatic timers to shut off electricity at predetermined time. Complete dryer catalog on request.

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The Chicago gas heated laundry plan is being used by many schools which operate their own laundry. Many schools have found it profitable to operate a small laundry to handle bath towels for their swimming pools. Other schools and colleges are operating complete laundries to handle their dormitory laundry, cafeteria work, etc. We can furnish either a single machine or a complete laundry. Cylinder type and oscillating type washers are available in capacities from 20 lbs. to 300 lbs. capacity per load. Centrifugal extractors are available in sizes from 17″ to 30″ capacity. Chicago gas heated and electric heated flatwork ironers are available in numerous sizes to handle virtually every need. Chicago tumbler type towel dryers handle bath towels at minimum cost.

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We will be glad to assist in planning installations to meet your needs.

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Cabinet Type Dryer



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OZALID does these jobs in seconds . . . because it employs a dry development technique which simplifies printmaking . . . and permits the processing of practically every type of material.

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OZALID MACHINES are available for all production requirements... and can be operated efficiently by anyone. Largest model illustrated.





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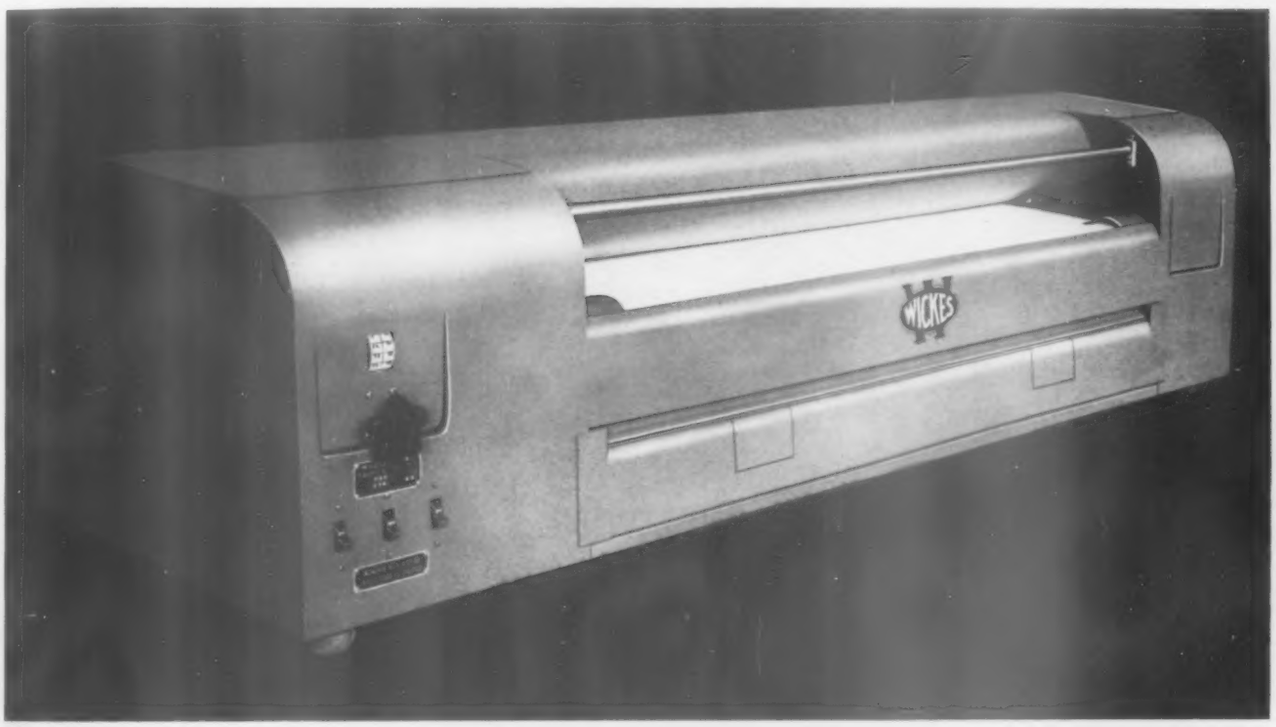
WICKES BROTHERS

Manufacturers of

Continuous Electric Blue Printing Machines

Saginaw, Mich.

ESTABLISHED 1854



THE WICKES CONTINUOUS SIMPLEX BLUEPRINTER

Designed and developed to meet the requirements of the small user as well as the larger manufacturing concern. Many of these printers are now being used in schools throughout the country. Moderate initial cost with economical operating cost make the machine desirable and practical for school use. Durable construction will afford protection against hard usage.

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Operating with one (1) standard mercury vapor lamp. This machine will print up to 250 square feet per hour. Rolls or cut sheets up to 42" wide by any length may be run at a speed ranging from 3" to 24" per minute.

Wickes Model E Printer

Equipped with two (2) standard mercury vapor lamps. This machine will print up to 500 square feet per hour. The speed range is from 6" to 48" per minute, and like the Model D machine, rolls or cut sheets may be printed up to 42" wide by any length.

Both the Model D and Model E machines can be furnished in the table model, as shown in the cut above, or in a floor style cabinet. The floor style cabinet consists of a large storage cabinet which is light-proof and which is ideal for storing chemicals, papers, etc.

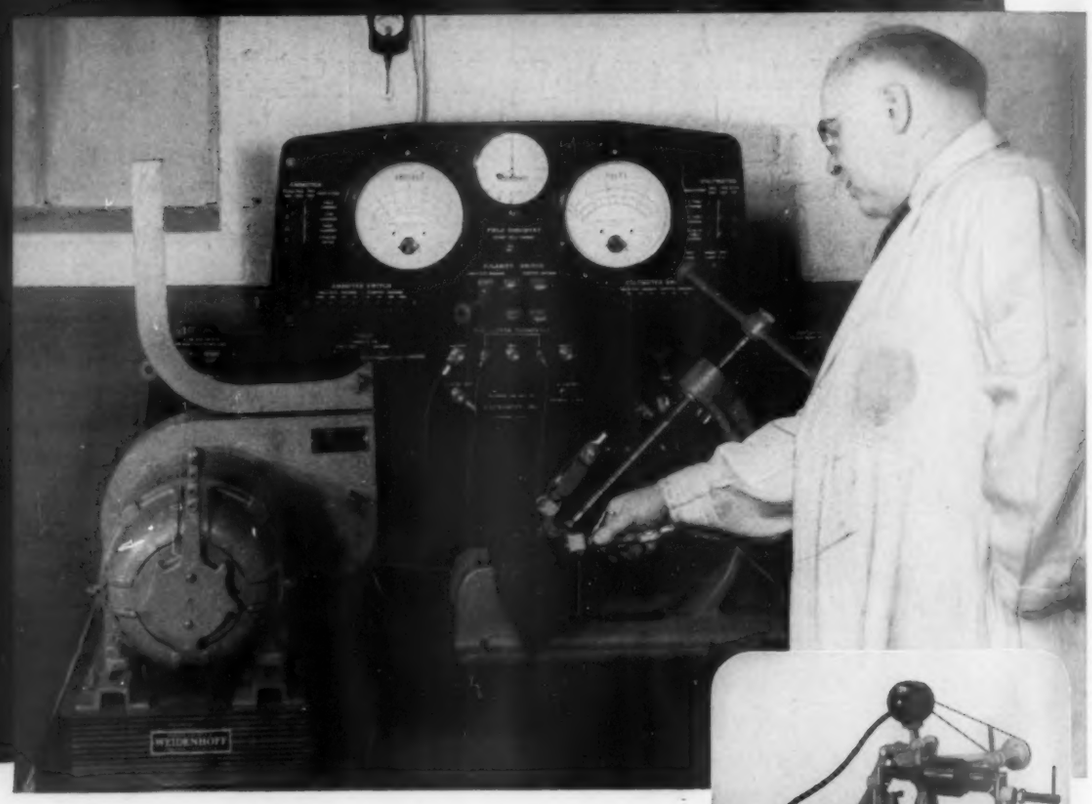
In addition to blueprint machines, Wickes Brothers are also manufacturers of special photographic and photocopy machines. These machines are designed for producing photocopies continuously and are available for use in schools desiring the latest in reproducing equipment. Details concerning these machines will be mailed upon request.

Your letter requesting further information, showing your requirements and advising us of the current available, will be promptly answered.

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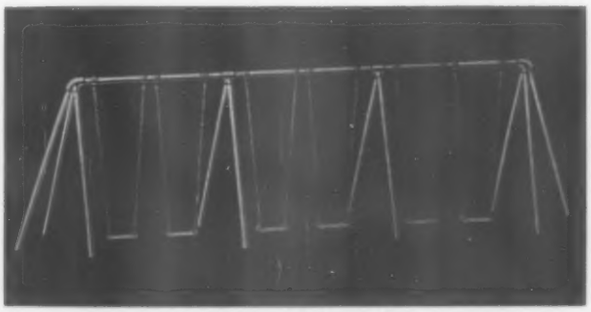
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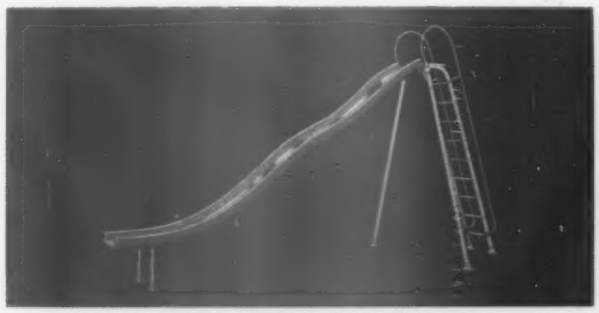
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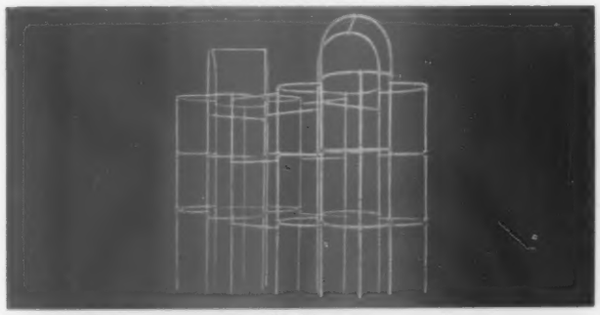
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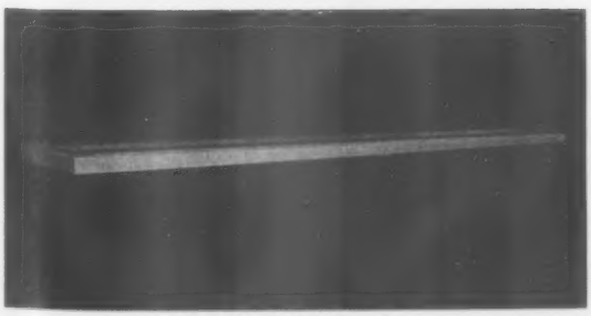
American Heavy-Duty Slides



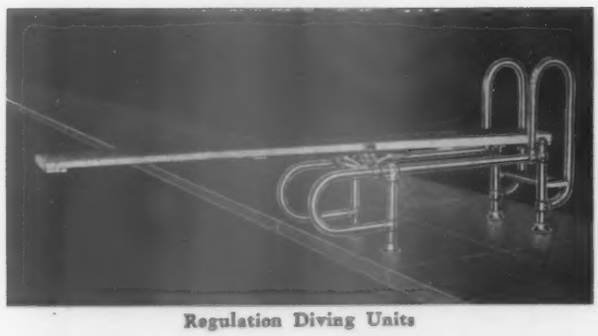
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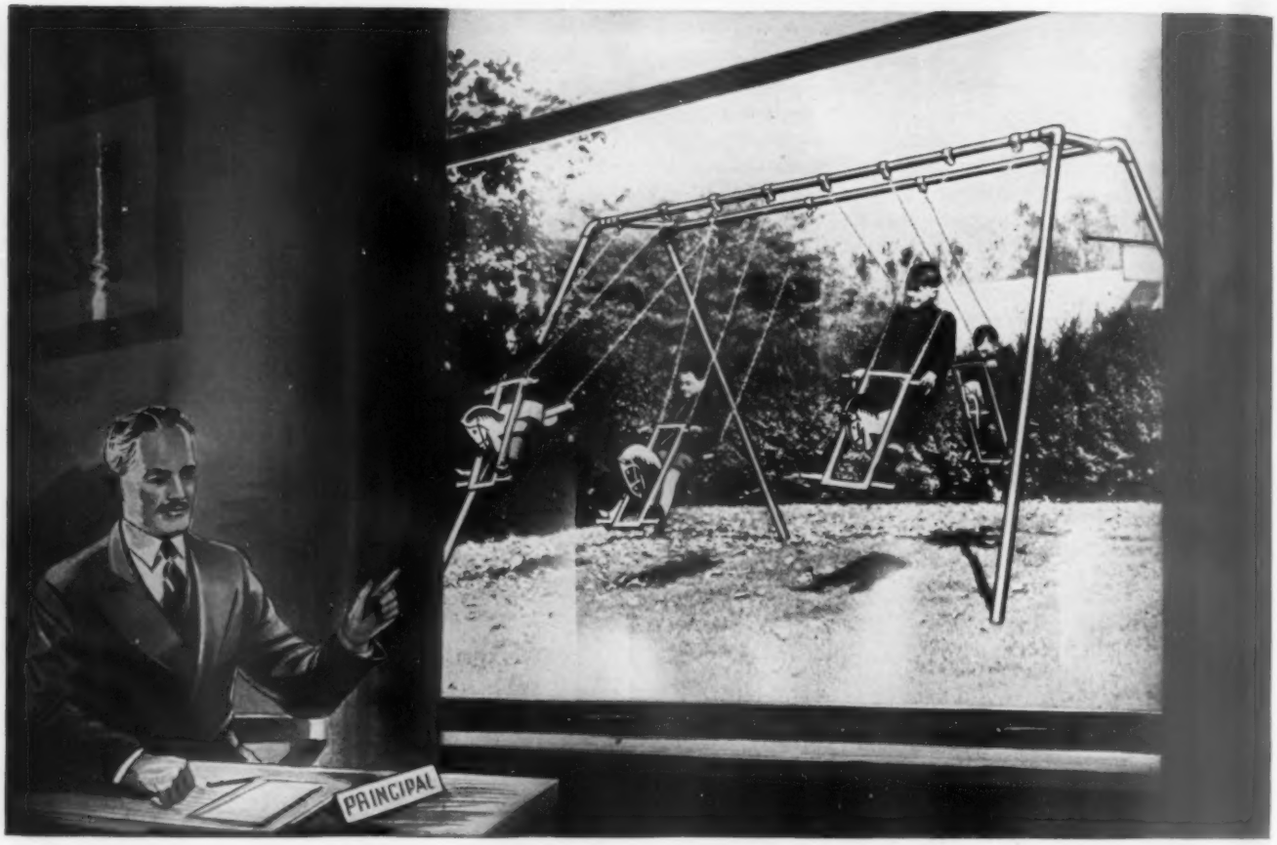
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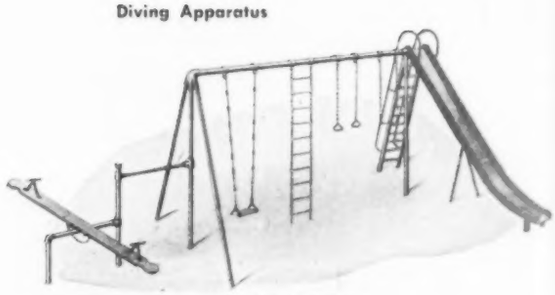
Merry-Go-Rounds



Diving Apparatus



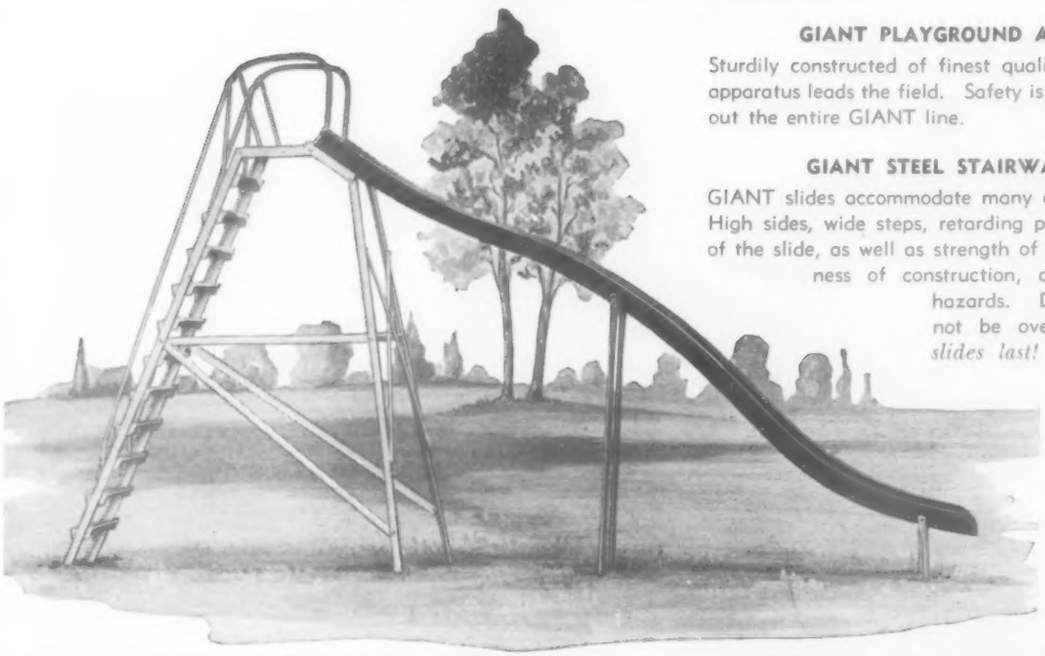
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Combinations

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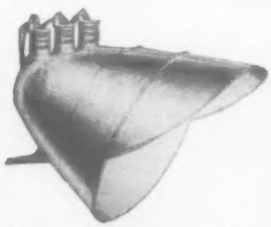
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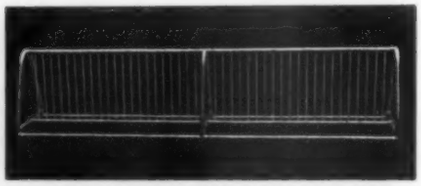
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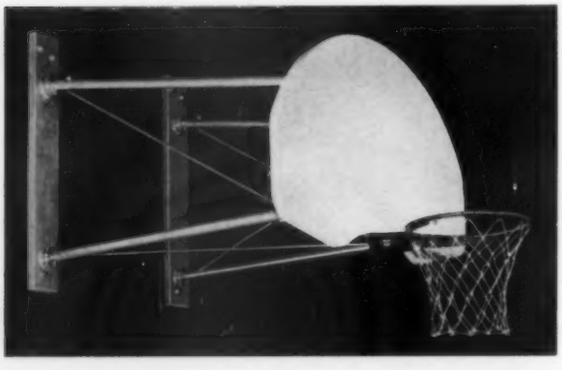


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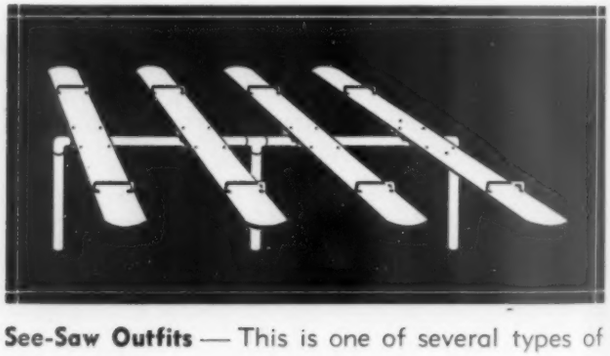
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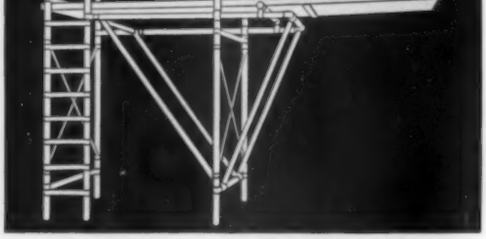
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To Prevent Athlete's Foot

Sanitation H T H solutions meet health department requirements for fungicidal use in foot-baths to prevent transmission of Athlete's Foot. Locker rooms, shower rooms, toilets, pool runways, etc., are undoubtedly among the worst offenders in the spread of Athlete's Foot. A valuable 48-page manual, "Keeping the Pool Safe and Sanitary," is available free upon request.

Health authorities agree that the best preventive is a careful sanitary routine which includes the use of hypochlorite solutions such as those made from H T H and Lo-Bax, both in footbaths and for general disinfection of surfaces which may transmit infection. Write us about The Mathieson All-Rubber Footbath especially designed to economically and efficiently combat Athlete's Foot.

Sterilizing and Bleaching

School laundries, like commercial laundries find that H T H solutions are uniform and economical for bleaching and sterilizing linens, towels, uniforms and other white goods, and as a sterilizing rinse for cotton bathing suits. Sanitation H T H enables them to avoid the danger of over-bleaching, which shortens the life of fabrics, and the alternate danger of inadequate protection.

OTHER MATHIESON PRODUCTS

H T H-15—An all-purpose germicide and deodorant which is ideal for use in school kitchens, dormitories, camps, etc. H T H-15 contains 15% available chlorine and is simply added direct to water by the spoonful.

Lo-Bax—A convenient chlorine carrier packed in 1¼-lb. bottles and containing 50% available chlorine. For preparing footbath solutions and for use around shower and locker rooms where limited quantities of hypochlorite are required.

PH-Plus—PH-Plus restores alkalinity which pool water loses during disinfection — eliminates acidity that makes eyes smart—makes purification more effective and residual chlorine less noticeable. Comes in convenient fused ½-lb. cakes packed in 100-lb. bags.

Super-Mafos—A unique dishwashing detergent in hard briquet form. Offers economical, efficient commissary control.



Louisiana State University swimming pool, where Coach Higginbotham uses H T H to clean, chlorinate and control algae

PENNSYLVANIA SALT MANUFACTURING CO.

1000 Widener Building, Philadelphia 7, Pa.

New York • Chicago • St. Louis • Pittsburgh • Cincinnati • Minneapolis • Wyandotte • Tacoma



thanks to
TILITE'S
double cleaning action
and Perchloron's
REG. U.S. PAT. OFF.
water purification...

TILITE does a *double* job... cleans swimming pools *chemically* and *mechanically*. By removing imbedded dirt and most stains, including rust, Tilite keeps your pool invitingly clean.

It's easy to use, effective and inexpensive... a little covers a lot of surface. Tilite-cleaned surfaces are free from the dangers of soap-washed surfaces because Tilite contains no slippery soap. For a generous FREE SAMPLE fill out and return attached coupon.

PER*CHLORON** serves as an effective sanitizer, not only for swimming pools but for many swimming pool accessories. It dissolves readily in water, releasing active, germ-killing chlorine.

Use Per*chloron* to sanitize pool walls, to chlorinate the water and as a disinfectant in foot baths, for washrooms and locker rooms. Unavailable for a while because of wartime demands, Per*chloron* may be purchased again in limited quantities. *Reg. U. S. Pat. Off.

TILITE
Reg. U. S. Pat. Off.

PENNSYLVANIA SALT MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA 7, PA.
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FREE SAMPLE—MAIL THIS COUPON



Pennsylvania Salt Manufacturing Co., Dept. ASU
1000 Widener Bldg., Philadelphia 7, Pa.
Please send me a free sample of Tilite.

NAME_____

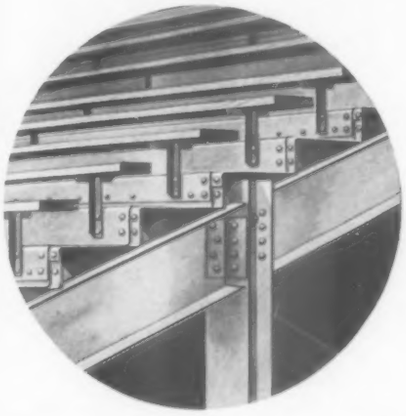
NAME OF POOL_____

ADDRESS_____

PITTSBURGH-DES MOINES STEEL COMPANY

3425 Neville Island, Pittsburgh, Pa.
Room 994—270 Broadway, New York
1215 First National Bank Bldg., Chicago
924 Tuttle Street, Des Moines, Iowa
1224 Praetorian Bldg., Dallas, Texas
614 Rialto Bldg., San Francisco, Calif.

Steel Deck Grandstands



Pittsburgh-Des Moines Steel Deck Grandstands serve schools and colleges from coast to coast with maximum values of safety, comfort, permanence and fine appearance for mass outdoor seating. Employing a unique system of unitized construction, these Grandstands permit complete design flexibility and rapid, economical erection. Built in standard sections, the original installation can be small or large, according to requirements; sections can be added at any time to increase capacity in depth, width or both. Units may be built along one, two or three sides of the field, or may completely enclose it. When assembled by bolts, stands may be dismantled and re-erected at a new location if desired; welded construction may be employed for permanent installation.

Pittsburgh-Des Moines Grandstands have weathertight steel decks supported by heavy steel underbracings. The underdeck space may be utilized for dressing rooms, toilet facilities, storage, etc.; when desired, masonry walls may be built along the ends and back of the stands to provide a total enclosure of the space under the stands. These Grandstands are finished complete with guardrails, steps or ramps, and built-in press box, if specified. Cast iron or welded steel stools, securely bolted to the deck, support the wood seat planks; other types of seats are furnished if desired.



SEATING CAPACITY

Pittsburgh-Des Moines Steel Deck Grandstands are built in standard sections 18 feet long by 10 rows deep, each section seating 120 people. A stand may be any number of sections long by any number of sections deep, with special sections provided for corners and to utilize all space available. Aisles, 3' 0" wide, extending from front to rear of the stand are spaced 36' 0" apart, measured from center to center of aisles. Thus, the net seating length of a bay is 18' 0" less half the width of an aisle or 16' 6". Allowing 16½" for each seat, there are 12 seats per row per bay or 120 seats per bay. On the basis of the above, the seating capacity of a standard stand may be calculated as follows: Length of stand in feet x 12/18 x number of rows = number of seats, or number of standard sections x 120 = number of seats.



(Circle) **Deck Construction Detail**

(Above, Left) **General Deck View**

(Left) **Underdeck Supports, Showing Sturdy Steel Construction**

The permanence of Pittsburgh-Des Moines Grandstands makes them a lifetime investment. They do not weather, rot or decay and, therefore, will not weaken or collapse. Their first cost is low, and they have a high salvage value. The only maintenance necessary is an occasional coat of paint, which keeps them looking new year after year. You are cordially invited to write to our nearest office for current literature; a Pittsburgh-Des Moines representative will be glad to consult with you on your future plans, and to provide any desired assistance without obligation.



Jefferson Davis Parish School, Monroe, Louisiana—Seating Capacity, 1850



Independent School District, Mason City, Iowa—Baseball Stand. Seating Capacity, 2500



Waterbury, Connecticut, High School. Masonry Enclosed Sides and Rear. Seating Capacity, 4400

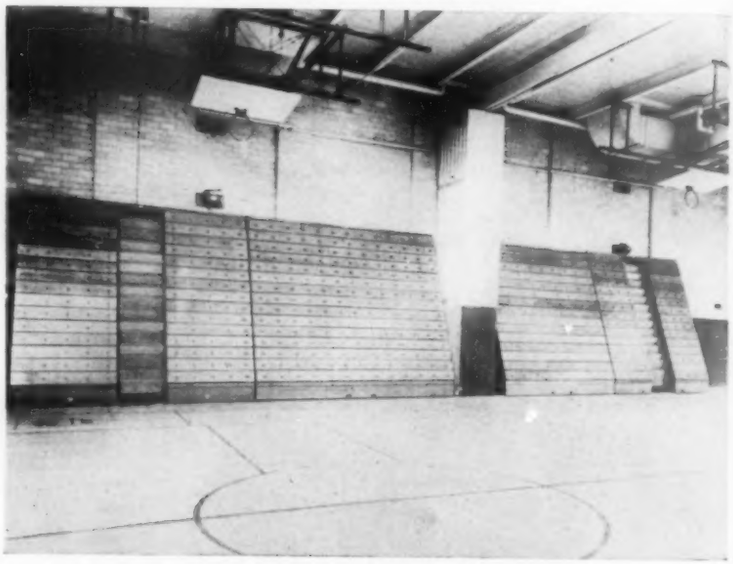
HORN MANUFACTURING CO.

Fort Dodge, Iowa

SALES AND SERVICE FROM COAST TO COAST

Horn FOLDING PARTITIONS AND FOLDING GYM SEATS

The **Horn** folding bleacher is the original telescoping bleacher, operating on the exclusive folding arm principle. This completely eliminates the use of slides and insures trouble-free operation for many years. Wherever seating in a school or public building is used, safety must be uppermost in mind. Therefore in purchasing folding bleacher equipment the skill and integrity of the manufacturer should receive full consideration. Behind the name **Horn** are more than 30 years of manufacturing experience and each product has been manufactured and designed from the standpoint of greater safety, ease of operation, and full value. **Horn** bleachers, like any good product, have been copied in design but have never been duplicated in quality.



16 Row Bleacher and Horn Folding Partition
High School, Mahanoy City, Pa.

A FEW OUTSTANDING FEATURES

No riser boards necessary . . . rigid understructure provides ample bracing without their use, resulting in greater comfort for spectators.

Eighteen-inch chair height seats.

Genuine rockite wheels fitted with oilless bronze bearings . . . no chance of rubber oxidation thus insuring longevity of wheel.

Steel X-bracing insures rigidity at all times . . . bleacher cannot get out of alignment.

Load directly on floor at all times.

Automatic locking system locks bleacher in open position. No bolts or rubber pads are used to accomplish locking.

Seatboards automatically tilt to completely close the bleacher when stacked.

No special supports or wall connections are necessary since load is direct to the floor.

Height of bleacher in closed position same as when in use.

Seat and footboards of comb grain Fir with splined ends. All boards not less than 5/4" thick before sanding.

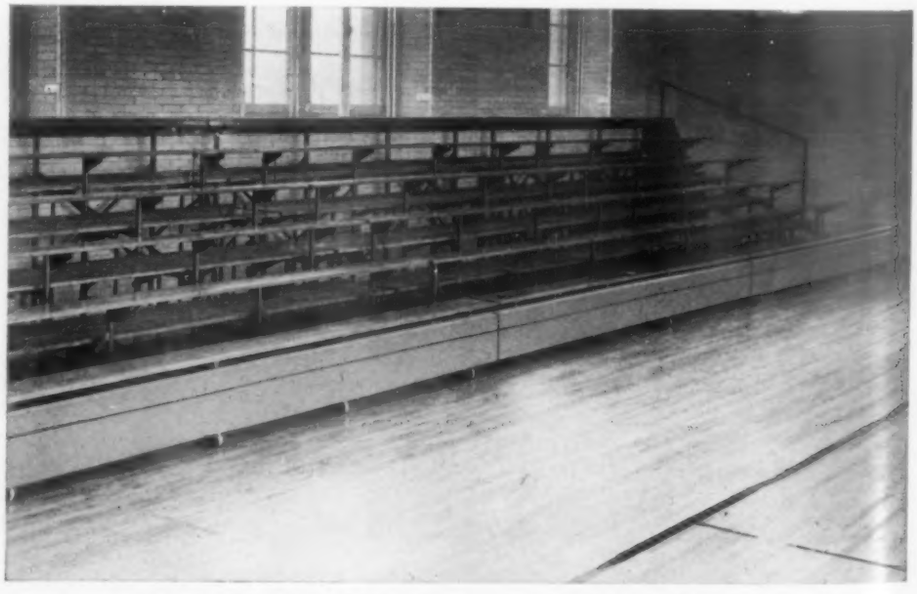
ENGINEERING DATA

Engineering Service

Since it is impossible to catalog all the special information on equipment of this kind, it is suggested that you permit our Engineering Department to prepare the layouts and specifications. This is a service regularly rendered and will not obligate you in any way. Write to Home Office addressing Engineering Department.

COST

For cost estimates send a layout of your gymnasium. Price lists are not published since the cost depends entirely on the quantity involved. The cost of HORN bleachers, however, is less per seat than the cost of ordinary auditorium chairs.



6 Row Bleacher with Guard Rail — Automotive School, New York City

HORN FOLDING GYM SEATS

GENERAL DATA

The **Horn** folding bleacher is the original telescoping bleacher which operates on the exclusive folding arm principle. This completely eliminates the use of slides and insures trouble-free operation.

When the **Horn** bleacher is in the stacked position, seatboards automatically raise to form the enclosure, eliminating necessity of special panels or riser boards.

When bleacher is in use, space under the seat affords ample leg room since there are no obstructions under the seatboards. The rise from seat to seat is uniform for all rows and distance from footboard to seatboard is 18 inches.

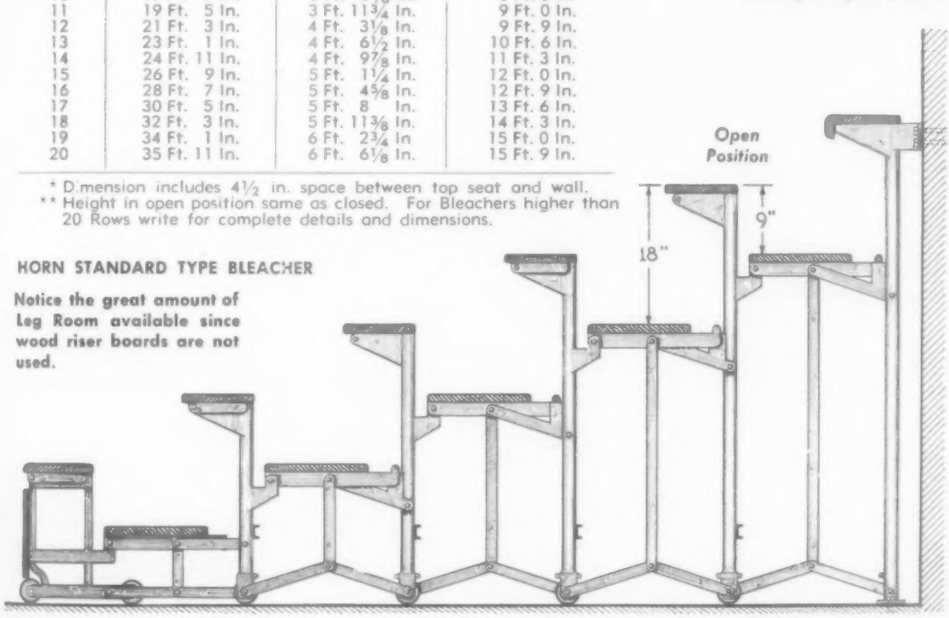


NOTE: It is suggested that the top seat be set out from the wall not less than 4½ inches, as otherwise that seat will be decidedly uncomfortable. The space requirement schedule allows for this space. When making comparisons be sure to consider this space.

SPACE REQUIREMENTS—Standard Bleacher

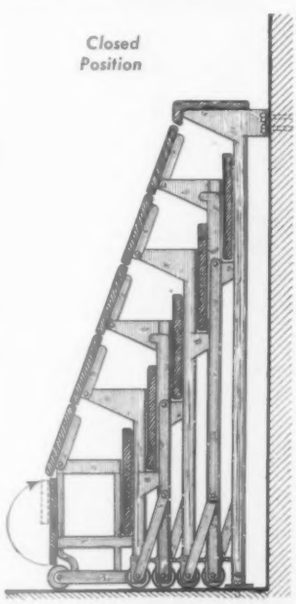
Rows	FLOOR SPACE		** Height
	In Use	* Closed	
3	4 Ft. 9 In.	1 Ft. 8¾ In.	3 Ft. 0 In.
4	6 Ft. 7 In.	2 Ft. 0⅛ In.	3 Ft. 9 In.
5	8 Ft. 5 In.	2 Ft. 3½ In.	4 Ft. 6 In.
6	10 Ft. 3 In.	2 Ft. 6⅞ In.	5 Ft. 3 In.
7	12 Ft. 1 In.	2 Ft. 10¼ In.	6 Ft. 0 In.
8	13 Ft. 11 In.	3 Ft. 1⅝ In.	6 Ft. 9 In.
9	15 Ft. 9 In.	3 Ft. 5 In.	7 Ft. 6 In.
10	17 Ft. 7 In.	3 Ft. 8⅜ In.	8 Ft. 3 In.
11	19 Ft. 5 In.	3 Ft. 11¾ In.	9 Ft. 0 In.
12	21 Ft. 3 In.	4 Ft. 3⅛ In.	9 Ft. 9 In.
13	23 Ft. 1 In.	4 Ft. 6½ In.	10 Ft. 6 In.
14	24 Ft. 11 In.	4 Ft. 9⅞ In.	11 Ft. 3 In.
15	26 Ft. 9 In.	5 Ft. 1¼ In.	12 Ft. 0 In.
16	28 Ft. 7 In.	5 Ft. 4⅝ In.	12 Ft. 9 In.
17	30 Ft. 5 In.	5 Ft. 8 In.	13 Ft. 6 In.
18	32 Ft. 3 In.	5 Ft. 11⅜ In.	14 Ft. 3 In.
19	34 Ft. 1 In.	6 Ft. 2¾ In	15 Ft. 0 In.
20	35 Ft. 11 In.	6 Ft. 6⅛ In.	15 Ft. 9 In.

* Dimension includes 4½ in. space between top seat and wall.
** Height in open position same as closed. For Bleachers higher than 20 Rows write for complete details and dimensions.



HORN STANDARD TYPE BLEACHER

Notice the great amount of Leg Room available since wood riser boards are not used.



HORN FOLDING BLEACHERS

SPECIFICATIONS

(1) All folding bleachers shown on the plans shall be **Horn** Accordion Folding Bleachers as manufactured by the **Horn Manufacturing Company,** Fort Dodge, Iowa.

(2) Bleachers shall be installed by factory-trained mechanics and the entire installation guaranteed against faulty materials, workmanship, and operation.

(3) Quantities are as follows: Total length of sections shall be **(specify)** consisting of **(specify number)** rows. When closed, seats shall not extend from the wall in excess of **(specify).** When open, seats shall not extend from the wall in excess of **(specify).**

(4) Bleachers when in use shall be designed and constructed to safely support, in addition to their own weight, a live load of 120 lb. per lineal foot on both seatboard and footboard and a horizontal swaying force applied to the seats of 24 lbs. per lineal foot of seats plus a factor of safety of 4.

(5) Bleachers shall operate on the telescoping principle, whereby all seats fold below the top seat accomplished by means of folding arms. No rollers or slides will be permitted. Units shall be fitted with heavy duty composition rollers to prevent marring floor. They shall be so arranged that any number or all of the seat rows may be extended for use as required. Provide automatic locking equipment which will positively lock the bleachers in open position without the use of bolts or floor sockets.

(6) When bleachers are in a closed position, the seatboards shall automatically rise to an upright position to completely enclose the unit. Provide cylinder locks, keyed alike.

(7) Seatboards and footboards shall be genuine edge grain Douglas Fir, 1¼ in. thick before sanding. Edges of all boards shall be splined to prevent splitting. Woodwork shall be finished with two coats of the best quality of bakelite sealer in a standard color. Steel understructure shall be given two coats of school furniture brown or chrome aluminum.

HORN MANUFACTURING COMPANY, FORT DODGE, IOWA

LEAVITT CORPORATION

206–220 Griggs Street, Urbana, Illinois

KNOCKDOWN BLEACHERS



KNOCKDOWN bleachers as used outdoors



or moved indoors



ADD-A-SEAT stadium
(under construction)

As originators of portable bleacher seating we respectfully solicit inquiries concerning your bleacher needs of all types wood, or steel.

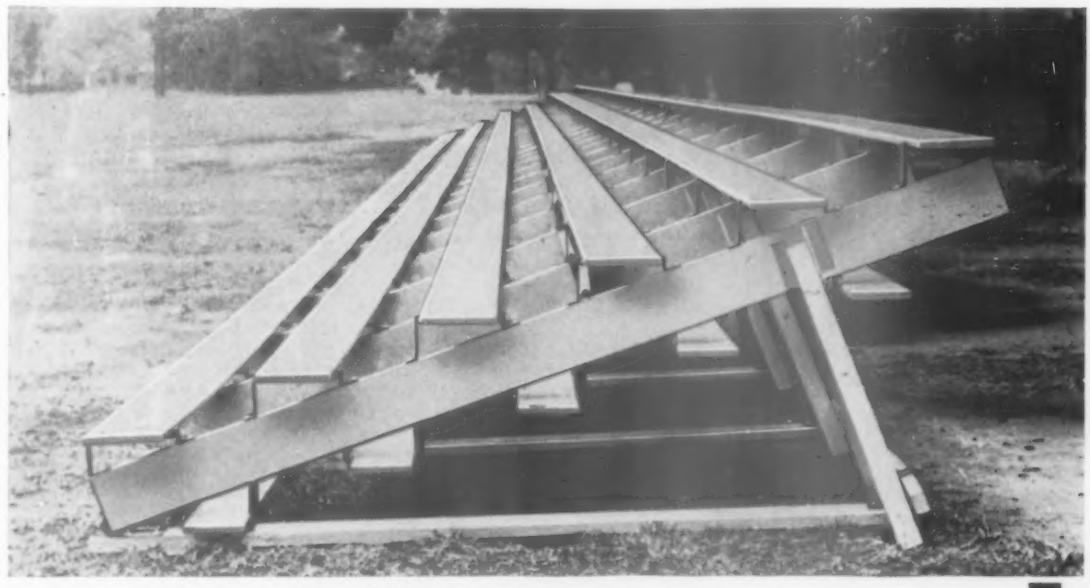
The picture, at the left, presents a view of our ADD-A-SEAT stadium under construction as a War Memorial. Note the rigidity and permanency of structure.

Our gymnasium Telescoping bleachers solve the need for added floor space.

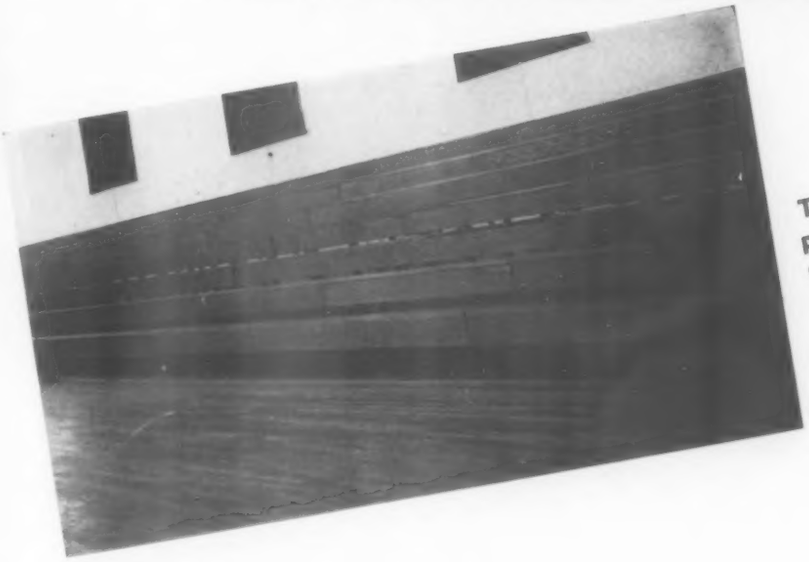
KNOCKDOWN was the first portable bleacher and remains famous for the many safety and comfort features exclusive to its design.

KNOCKDOWN BLEACHERS

"THEY RISE TO THE OCCASION"



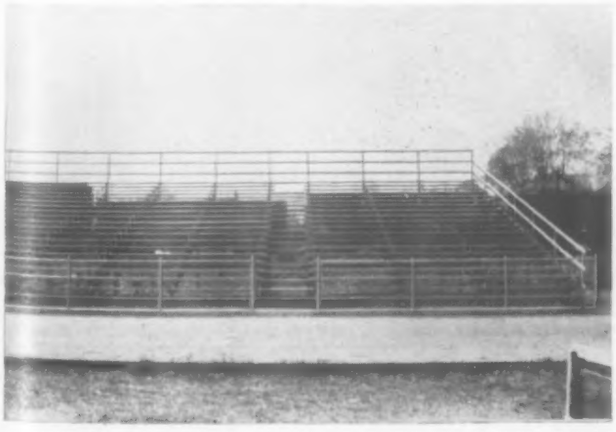
6 Tier provides seats for any occasion



Telescopic type provides greater utility of floor space

ADD-A-SEAT stadium (steel)

A War Memorial that will live





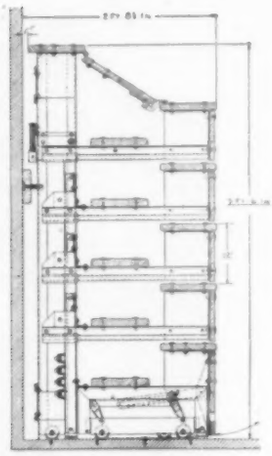
FRED MEDART MANUFACTURING CO.

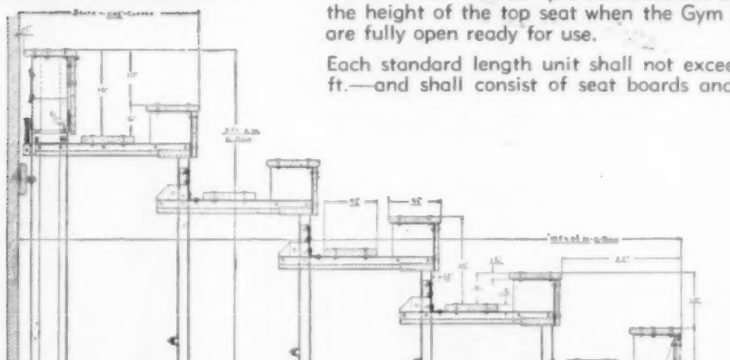
Potomac and Decalb Streets
Saint Louis, Mo.
ENGINEERING AND SALES SERVICE IN ALL PRINCIPAL CITIES

MEDART TELESCOPIC GYM SEATS

Outstanding among the many features of this modern seating is the ease with which seats glide in and out of the "nested" position, in one operation. Use of the telescopic principle eliminates the need for any counterbalance mechanism (springs) and consequently there is nothing to lift up or to pull down; no closure panel and no possibility of any parts of the seat falling on the operator. Understructure is of steel; all wood parts are full length. Top and bottom kickboards and intermediate risers are of steel. When Medart Gym Seats are installed in a gymnasium it is possible to quickly and easily provide a bench with a comfortable back rest for dances or special classes of instruction by simply withdrawing the one (lower) row of seats from the "nested" position, thus eliminating the need for folding chairs or other auxiliary seating. Medart Gym Seats are fully approved and recommended by the structural engineering department of one of our leading universities as a result of an exhaustive analysis and of actual tests made by these authorities.

THE WALL ATTACHED TYPE





Specifications

As shown on plans and as covered by these specifications, contractor will deliver (and install) the following standard (and special) length units of Medart Telescopic Gym Seats, as manufactured by FRED MEDART MANUFACTURING CO., ST. LOUIS, MO., or the approved equal in the opinion of the architect.

. . . standard 16 ft. long units, . . . rows high
. . . special . . . . . long units, . . . rows high

Gym Seats shall operate on the telescopic principle, which requires only one operation for opening (or closing) and shall permit one or more rows of seats to be opened for use, while the remaining rows are left in the closed or "nested" position. When closed, Gym Seats shall not extend from the wall in excess of 2 ft. 8 in.; when in open position, Gym Seats shall not extend from wall in excess of . . . . (see table below). The height of the Gym Seat in the closed or "nested" position shall not exceed the height of the top seat when the Gym Seats are fully open ready for use.

Each standard length unit shall not exceed 16 ft.—and shall consist of seat boards and foot boards of quality lumber which shall be carefully sanded, finished with rounded corners and bolted securely to steel members. All wood to be stained, shellacked and varnished. Risers to be formed of 16 ga. steel.

The understructure shall be entirely of steel with uprights or posts of formed steel, double channel construction for maximum strength. Each standard length of seat to be supported by four such uprights or posts which are transported in and out of the closed or "nested" position by means of a multiple of rubber rollers with bronze bushings. When live load is applied, the added weight shall automatically overcome the tension of the compression springs attached to each upright, thus bringing the uprights or posts in direct contact with the floor.

All steel parts shall be finished with two coats of baked-on school furniture brown enamel.

To provide proper circulation of air, steel grilles shall be inserted in the riser (kick board) of the first (bottom) and top row of seats wherever a unit of Gym Seats is placed in front of a heating or ventilating unit. (. . . . units shall be furnished with grilles.)

Number of rows	Floor space		Height open or closed
	Extended	Closed	
3	4 ft. 6 in.	2 ft. 8 in.	3 ft. 0 in.
4	6 ft. 4 in.	2 ft. 8 in.	3 ft. 10 in.
5	8 ft. 2 in.	2 ft. 8 in.	4 ft. 8 in.
6	10 ft. 0 in.	2 ft. 8 in.	5 ft. 6 in.
7	11 ft. 10 in.	2 ft. 8 in.	6 ft. 4 in.
8	13 ft. 8 in.	2 ft. 8 in.	7 ft. 2 in.
9	15 ft. 6 in.	2 ft. 8 in.	8 ft. 0 in.

THE MOVABLE TYPE

For the occasional need or special condition when auxiliary seating, that can be quickly and easily moved from one location to another, is required. . . . Seats operate on the approved telescopic principle. . . . Ideal for use on the stage; in combination lecture and classrooms; to encompass the boxing or wrestling ring — and wherever else spectators must be accommodated with safe, practical, satisfactory seating. Easily moved to and from the storage room.

MEDART ENGINEERING SERVICE

A competent staff of Medart engineers is available to help you plan and lay out the most efficient and economical installation of equipment to meet your own special requirements. No obligation.

MEDART CATALOGS WILL BE FURNISHED UPON REQUEST

MEDART BASKETBALL BACKSTOPS

BALCONY TYPE BACKSTOPS

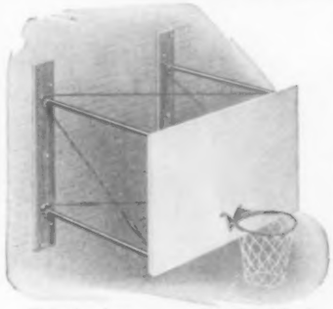


An economical method of installation but having obvious disadvantages. It is advisable to limit this type to practice courts. May be permanent (No. 478) or detachable (No. 479).



Backboard attached flush to face of balcony below floor level. Undesirable from spectators' viewpoint and because of restricted shots from corners of floor (No. 480).

WALL BRACED BACKSTOPS

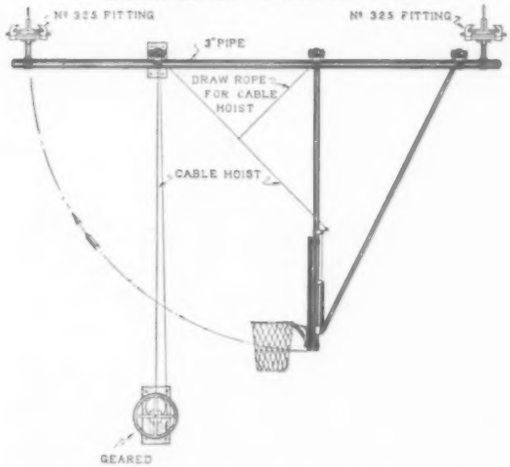


This backstop can be furnished with various length extension braces—2 ft. (No. 55), 3 ft. (No. 458), 4 ft. (No. 459), 5 ft. (No. 461). 6-, 7-, or 8-ft. braces can also be supplied.



Structural condition and building equipment often necessitate special support. Illustration shows a bank with 2-ft. braces. (No. 439). Can be modified to suit.

SWING-UP BACKSTOPS



A steel cable attached to a friction geared winch raises the backstop forward, up to the ceiling. Diagonal braces are double knuckle jointed and elongate as backstop is being raised forward. When in lowered position, braces are automatically locked (No. 261).

SUSPENDED BRACED BACKSTOPS



A common method of suspending a bank from 3-in. overhead pipe supports spanning the distance between a wall and girder. Recommended where walls are weak, where interference prohibits wall stringers, and where heavy banks are extended excessively (No. 420).

BACKBOARDS



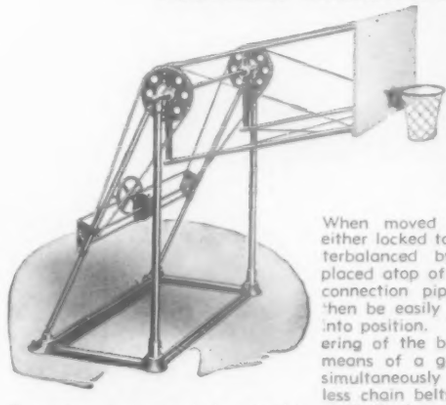
We no longer manufacture rectangular-shape backboards as shown in above illustrations, but furnish only the new fan-shaped backboard made official by the National Basketball Committee of the United States and Canada. The **Medart Steel Fan-Shaped Basketball Backboard** has many superior and exclusive features, including:

One-piece steel construction; Smooth, unbroken surface; Deep 1½-inch side flange; Smooth, rounded edges; Steel braces 3 inches wide, "H" type, channel shaped—two horizontal and one vertical, securely welded to the backboard and to each other, providing absolute rigidity and an equal degree of bracing to the entire surface.

Four sets of 2 floating attachment lugs—provided (only by Medart) so that new backboards may easily be attached to old braces.

This backboard is fabricated to the same degree of perfection as the old Medart backboard. Size: 54 x 35 inches.

PORTABLE BACKSTOPS



Where girder heights in field houses are excessive, this floor-type backstop is ideal. It can be moved from place to place without dismantling.

When moved into position and either locked to the floor or counterbalanced by concrete blocks placed atop of the two rear base connection pipes, the bank can then be easily and quickly raised into position. The raising or lowering of the bank is effected by means of a geared winch which simultaneously operates two endless chain belts.

The face of the bank is brought out 7 ft. from the foremost pipe uprights and over 10 ft. from the cross pipes supporting the winch, thus giving maximum clearance under the basket. This backstop is practical, rigid, ruggedly built and easily handled (No. 455).

WAYNE IRON WORKS

Wayne Penna.

Folding & Rolling Gymstands, Steel Portable Grandstands, Permanent Stadiums, Steel Deck Stands, Fencing of all types . . . for boundary, athletic fields, tennis courts, etc.



▲ **WAYNE ROLLING GYMSTAND** — By folding out of the way when not in use, this stand makes smaller, less costly buildings practical.

ROLLING MOVABLE GYMSTAND — Same as rolling gymstand except when closed can be moved from place to place, on two-caster trucks. Request descriptive folder.

LET WAYNE'S 26 YEARS' SEATING EXPERIENCE SAVE YOU TIME, MONEY AND "HEADACHES"

The planning stage is an important factor in the ultimate cost of a grandstand and the degree of service and satisfaction it will give. In selecting the site—determining the length and number of rows—debating whether or not to allow for future additions—in fact, in all preparatory details, Wayne is ready to cooperate with you in determining the type grandstand best suited to your needs and budget. Wayne makes available to you its technical advisory service, as follows:

1. **Appraisal of requirements:** A Wayne local representative will come directly to your office for a discussion of your grandstand needs and an inspection of the proposed site.
2. **Recommendations:** From an analysis of this information, Wayne engineers prepare suggested layouts, specific recommendations and quotations for your approval.

Wayne recommendations are unbiased, as Wayne is the only company building all types of steel indoor and outdoor grandstands—economical standardized units, as well as "custom built" installations. In each case we offer the type of construction best suited to your requirements, rather than endeavor to sell you some particular type of grandstand.

MEET ALL CODE REQUIREMENTS

In buying or specifying a Wayne Grandstand you may be sure of one important fact—it is the product of over 26 years of progressive engineering practice devoted to the design, manufacture and erection of grandstand equipment for schools, colleges, municipalities and industrial concerns. As a result of this specialization, the use of the best materials, the employment of experienced construction men and the strict adherence to code requirements, a school is assured of a job which will last as long as the school buildings themselves—be a credit to the school and its community—and measure up to the high standards established by Wayne in over 1,000 grandstand installations. Call on Wayne today—representatives in 42 cities—or write for new "Grandstand IDEA Book." Wayne Iron Works, 544 No. Pembroke Avenue, Wayne, Pa.

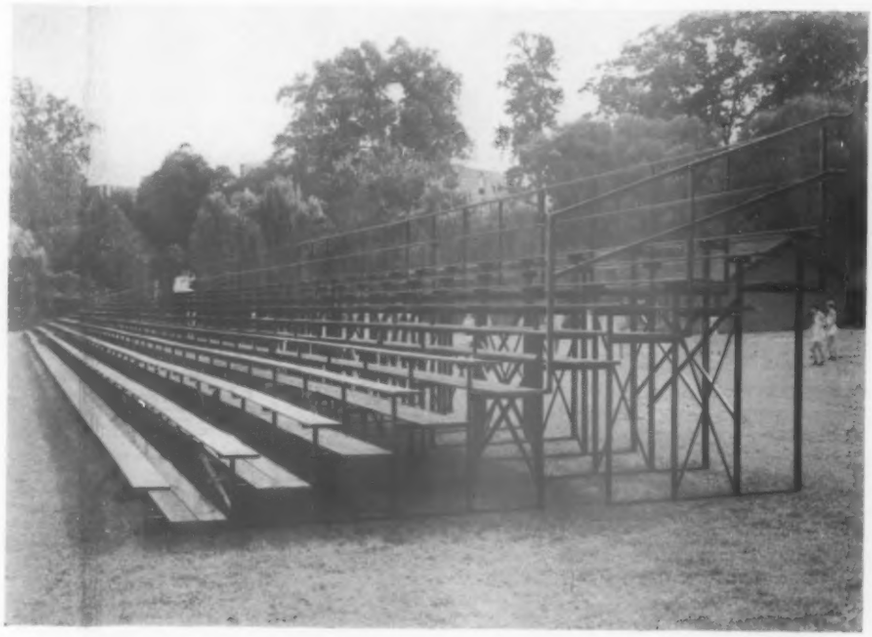


▲ **WAYNE TYPE "C" PORTABLE GRANDSTAND** —Can be set up or taken down faster than any other steel grandstand. No tools, bolts, nuts or screws used. Indoor or outdoor use. Moderate cost. Write for folder.



◀ **WAYNE "BC" PERMANENT GRANDSTAND**—This is one of several types of Wayne permanent grandstands. Each installation designed to fit conditions at the site. Wayne has made installations seating many thousands of people. New folder just off press.

"Wayne Stands for Safety"



TYPE "H" STANDARD PORTABLE

Neat appearance, adaptability and low cost have made this Wayne steel portable grandstand very popular, especially where limited budgets are involved. Made in 16 foot units and available up to 15 rows high.

This is one of several standard types of grandstands designed for maximum economy. Special requirements can usually be met by simple modification of standard designs. Write for illustrated descriptive literature, or outline your needs for our recommendations.

SPECIFICATIONS FOR WAYNE TYPE "H" GRANDSTAND

1. General Description— (a) Furnish, f.o.b. _____, ___ linear feet of ____ row portable steel bleachers, to be type "H" as manufactured by Wayne Iron Works, Wayne, Pa., or equal, as approved by

2. Design— (a) Bleachers shall be designed to support, in addition to their own weight, a live load of 120 pounds per linear foot of seatboards, plus 120 pounds per linear foot of footboards, and to withstand a side sway load of 24 pounds per linear foot of seatboard and a front-to-back sway load of 10 pounds per linear foot of seatboard. Under these loads stresses in steel shall not exceed those specified by the American Institute of Steel Construction, and stresses in wood shall not exceed those specified by the U. S. Forest Products Laboratory. The bleachers shall be so constructed that they will conform to inequalities in the ground without increasing stresses beyond the limits specified, and without jeopardizing the stability of the structure or the safety of its occupants.

(b) For Pennsylvania only: The successful bidder shall submit satisfactory evidence of the formal approval of the Pennsylvania Department of Labor and Industry of the particular type of bleacher he proposes to furnish.

3. Seat and Footboards— (a) Seat and footboards shall consist of clear lumber 16 feet long, surfaced 4 sides to 1⅛" x 9½" and shall be bolted during erection to the supporting frames.

4. Painting— (a) All parts of the bleachers shall be properly cleaned and shall have one coat of best quality enamel or lead and oil paint applied at the shop.

5. Railings— (a) Railing shall be of steel, 3 feet high above the seats, have two rails, and shall be bolted to the supporting frames during erection. They shall be capable of supporting a vertical load of 80 pounds per linear foot and a horizontal thrust of 25 pounds per linear foot.

DIMENSIONS AND SEATING CAPACITY—The Wayne type "H" portable steel stand is made in 16 foot standard lengths, from 2 to 15 rows high. The depth of a 2 row stand is 2'-7½" and the dimensions range up to 26'-11" in the case of the 15 row stand. Height of top seat of the 2 row stand is 1'-11¾" and that of the 15 row unit is 10'-7¾". Railings are provided on stands of 6 rows and up as required. Seating capacity based on a width of 16" per seat, can be determined by multiplying the number of units by the figures indicated below.

		2 Rows	3 Rows	4 Rows	5 Rows	6 Rows	7 Rows	8 Rows	9 Rows	10 Rows	11 Rows	12 Rows	13 Rows	14 Rows	15 Rows
L'gth	No. Units	← SEATING CAPACITY →													
16'	1	24	36	48	60	72	84	96	108	120	132	144	156	168	180

Specifications covering Wayne "Gymstands", both rolling and folding, appear in Sweets' File for Architects.

"Wayne Stands for Safety"

WILLIAMS IRON WORKS, INC.

Designers and Manufacturers of Permanent and Portable Safe Steel Grandstands

430–438 East 102nd Street
New York, N. Y.

TELEPHONE
ATwater 9-8610

General

Since the establishment of this company, 35 years ago, we have specialized in the manufacture of mass seating equipment. During our existence we have designed and erected some of the largest installations in the United States.

Correctness of engineering design, the use of only structural steel that conforms to the rigid specifications of the American Society for Testing Material for Structural Steel for Buildings, and workmanship that is cognizant of the responsibility for the safety of spectators, are factors that make every Williams Grandstand absolutely safe, practical and economical.

On all types of Williams Grandstands, both portable and permanent, there is sufficient room between rows to permit free leg room. Footboards are wide enough to provide sufficient walking space—there is no open space for spectators to slip through. The rise between seatboards provides ample and unobstructed visibility.

Correct engineering prohibits sidesway and because all parts interlock, the heavier the spectator load, the greater compactness of the structure. Every Williams Grandstand is constructed to hold four times the given load.

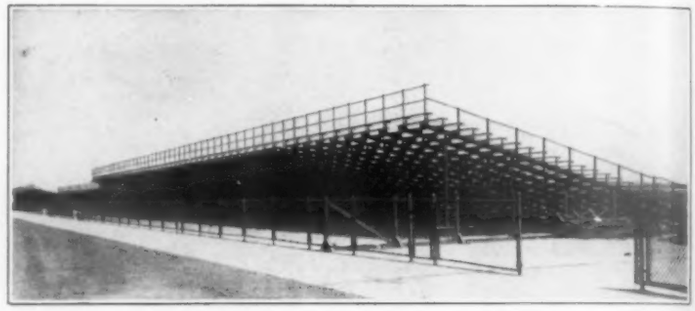
In the many years that Williams Grandstands have been in use, there has never been an accident due to faulty construction.

Portable Grandstands

Being constructed in easily handled sections, with simple construction principles, these Grandstands are easily and quickly erected by unskilled labor and can be as easily disassembled and stored compactly. Specially designed Angle Bents and Stringers automatically adjust themselves to uneven terrain, requiring no special foundations.

Length and height are easily increased by the addition of standard and interchangeable sections.

The same material erected along football side-lines can be re-erected in different sizes and heights for baseball seating or smaller individual sections. The adaptability of Williams Portable Stands is a feature that commends itself to athletic authorities.



Stands Used for the New York World's Fair

Economy

Stands used by municipalities soon pay for themselves. The cost of erecting and dismantling wooden stands soon overbalances the initial cost of the Williams Stand. Too, there is the all-important factor of positive safety that is an all-predominant feature of this steel stand.

There is nothing to wear out on a Williams Stand, either Portable or Permanent. All Williams Stands are painted color of paint specified. With proper care, Williams Stands will last as long as any modern school plant.

Easy Erection

Stringers holding seat and foot board supports welded to the stringer are two right plates with the back slotted. There is also a slot in the upright steel angle of the bent. The stringer slot is slipped down into the upright and a secure connection is made. Lateral and side sway is prevented because of solid contact in all directions of the two connecting parts.

Seats will not rattle or bob, because of the patented "Sta-Tite" seat lock which is exclusive on all Williams Stands, and are quickly attached to their steel supports.

WILLIAMS "TYPE F" STEEL PORTABLE GRANDSTAND

This safe, practical grandstand will fully meet all requirements. In the construction of this stand a single foot board is used, all Bents and Stringers are made of steel, meeting all safety requirements.



Stringer About to Be Attached to the Bent



Patented "Sta-Tite" Seat Lock

Seats will not rattle or bob, and are quickly attached to their steel supports. In top angle of seat support is slot "A" into which slotted projection "B" on seat board enters. Movable bar "C" is turned into slot "B" and locks seat securely into place. To remove seat board, a hammer blow disengages bar "C." There are no loose bolts or removable parts in this foolproof lock.

The Type "F" can be supplied in any height from 2 to 30 rows and interchangeable sections are 14 to 16 ft. long. Seat and foot boards are 1⅛-in. Oregon fir. Seat boards are latched to supports by tamperproof lock. The safety side and back rails furnished.



Lateral and Side Sway Prevented by Sturdy Construction

Specifications for Portable Type Grandstand

Stands shall consist of seat and foot boards, supported by structural steel stringers and angle supports, riveted to stringers, held in position by vertical bents. No loose parts or bolts used.

Structural steel shall conform to the standard specifications of the American Society for Testing Materials for Structural Steel for Buildings, Serial designation A9-21, as amended to date.

Steel structures shall be so designed as to sustain dead weight imposed upon them, including weight of steel frame, in addition, a live load of 125 lbs. per sq. ft. of horizontal projection. Proper provision is to be made for temporary stress, caused by erection.

Stringers—Stringers shall be channel steel, not less than 4-in. channel. Bottom end of stringer shall have bearing plate welded to same for resting on the floor or ground.



Williams Portable Grandstand, Type "A"

Can be supplied in any number of rows from 2 to 50. The only difference between this grandstand and the Type "F" is that double width footboards are used.

Seat and Foot Board Supports—Supports shall not be less than 2 x 2 x 3/16-in. steel angles, riveted to stringer, forming one complete unit. Tops of angle support shall be slotted to receive lip of locking device.

Seat and Foot Boards—Seat and foot boards shall be made of selected Oregon fir. Boards to be not less than 1⅛-in. thickness. Seat Boards shall be 9½ in. wide, and have all sharp edges rounded. One foot board 12 in. shall be in uniform lengths of 16 ft., unless otherwise specified. All seat and foot boards shall have locking device attached to the underside, for fastening boards to supports, insuring absolute rigidity. Seats shall be spaced not less than 22 in. back to back. Height of seat above foot board shall be not less than 17 in. and the rise per row shall be not less than 8 in.

Locking device to be made of sheet steel plate 3/16 x 3 x 8 in. riveted to underside of seat and foot boards.

Bents—Bents shall consist of two vertical struts of 2½ x 2½ x 3/16-in. angle steel, braced horizontally and diagonally to insure rigidity against side sway, tops of each strut shall have proper provision for receiving stringers. Bearing plates, 6 x 6 x ¼ in. to be welded to foot of each bent, for resting on floor or ground. Horizontal and diagonal braces to be not less than 2 x 2 x 3/16-in. steel angles, and shall be welded to struts.

BASED ON A WIDTH OF 18" PER SEAT

		2 Rows	3 Rows	4 Rows	5 Rows	6 Rows	7 Rows	8 Rows	9 Rows	10 Rows
Total Depth		2'—7½"	4'—5½"	6'—3½"	8'—1½"	9'—11½"	12'—3"	14'—1"	15'—11"	17'—9"
Height Top Seat		1'—10"	3'—4½"	5'—10¾"	7'—5½"	8'—11½"	11'—6½"	13'—1½"	14'—8½"	16'—3½"
Length	No. Units	SEATING CAPACITY								
16'	1	24	36	48	60	72	84	96	108	120
32'	2	48	72	96	120	144	168	192	216	240
48'	3	72	108	144	180	216	252	288	324	360
64'	4	96	144	192	240	288	336	384	432	480
80'	5	120	180	240	300	360	420	480	540	600
96'	6	144	216	288	360	432	504	576	648	720
112'	7	168	252	336	420	504	588	672	756	840
128'	8	192	288	384	480	576	672	768	864	960
144'	9	216	324	432	540	648	756	864	972	1080
160'	10	240	360	480	600	720	840	960	1080	1200
176'	11	264	396	528	660	792	924	1056	1188	1320
192	12	288	432	576	720	864	1008	1152	1296	1440
208'	13	312	468	624	780	936	1092	1248	1404	1560
224'	14	336	504	672	840	1008	1176	1344	1512	1680
240'	15	360	540	720	900	1080	1260	1440	1620	1800
256'	16	384	576	768	960	1152	1344	1536	1728	1920
272'	17	408	612	816	1020	1224	1428	1632	1836	2040
288'	18	432	648	864	1080	1296	1512	1728	1944	2160

WILLIAMS PERMANENT STEEL GRANDSTANDS

Many large permanent steel grandstands open and canopied have been constructed by this organization.

Our staff of engineers and designers are fully capable of co-operating in furnishing comprehensive information.

If you are interested in this type of grandstand, we urge that you consult us, as our large plant facilities permit exceptionally attractive prices to be quoted.

Specifications for Permanent Steel Grandstands

Steel—Steel, whenever used, shall conform to the Standard Specifications of the American Society for Testing Materials for Structural Steel for Buildings A-9 as amended to date.

All structural members shall be not less than ¼ in. thick, except for the web of rolled structural shapes which shall be not less than seventeen one-hundredth (.17) of an inch thick.

Columns to be 8 in.; spaced 18 ft. on center.

Channel stringers to be 12 in.; 6 ft. on center.

Foot board supports to be 2 x 2 x ¼-in. angles, riveted and welded to channel stringers.

Framing to support channel stringers to be 12 and 15-in. I-beams.

Diagonal and longitudinal bracing to be of 1-in. rods.

Railing to be of pipe and angles.

All shop connections to be riveted and field connections to be bolted.

Lumber—Seat boards to be 2 x 10-in. Clear Oregon Fir dressed on sides.

Foot boards to consist of two 2 x 10-in. Clear Oregon Fir dressed on four sides.

All to be bolted to structural steel members by 5/16-in. carriage bolts.

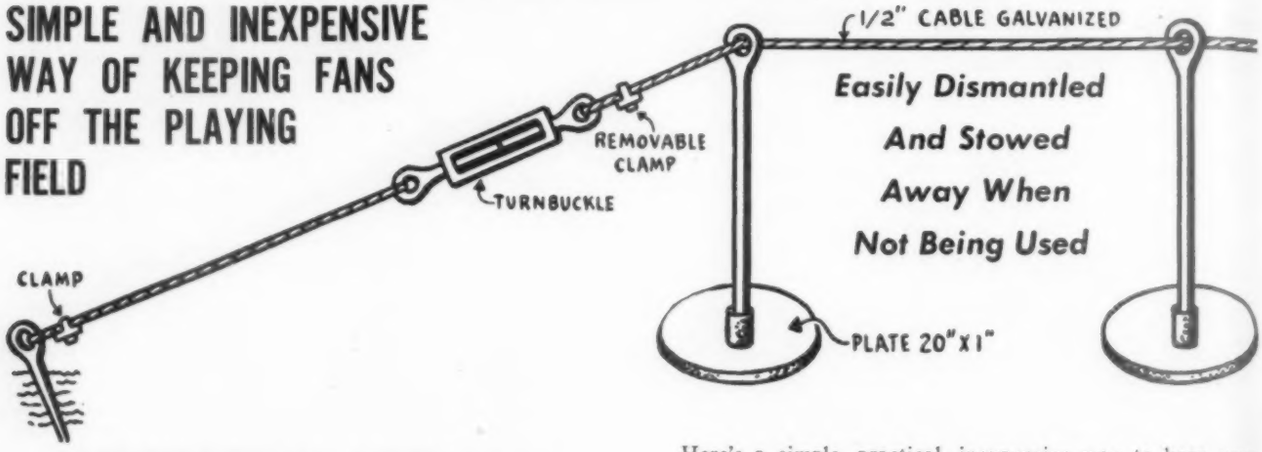
Painting—All steel and lumber to be painted one coat of paint in the shop and one field coat.



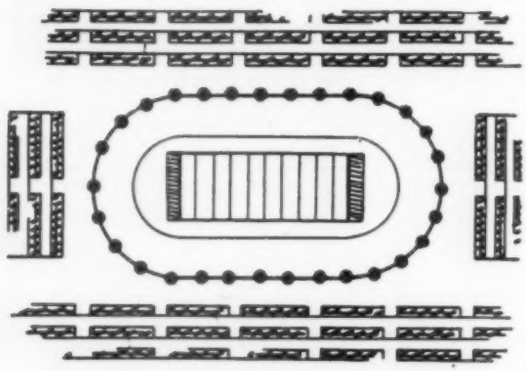
NOTE TO ARCHITECTS

WILLIAMS IRON WORKS, INC. *also manufacture and erect miscellaneous iron and ornamental iron work for buildings. Estimates furnished.*

SIMPLE AND INEXPENSIVE WAY OF KEEPING FANS OFF THE PLAYING FIELD

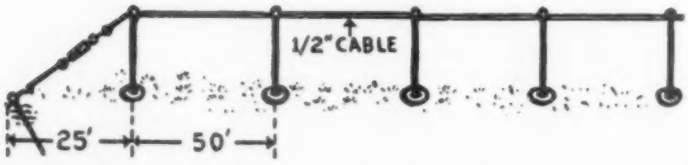


Here's a simple, practical, inexpensive way to keep your sports fans off the playing field—to prevent them from interfering with the action and to save wear and tear on the field. When not in use, this simple restraining apparatus is easily dismantled and stowed away.

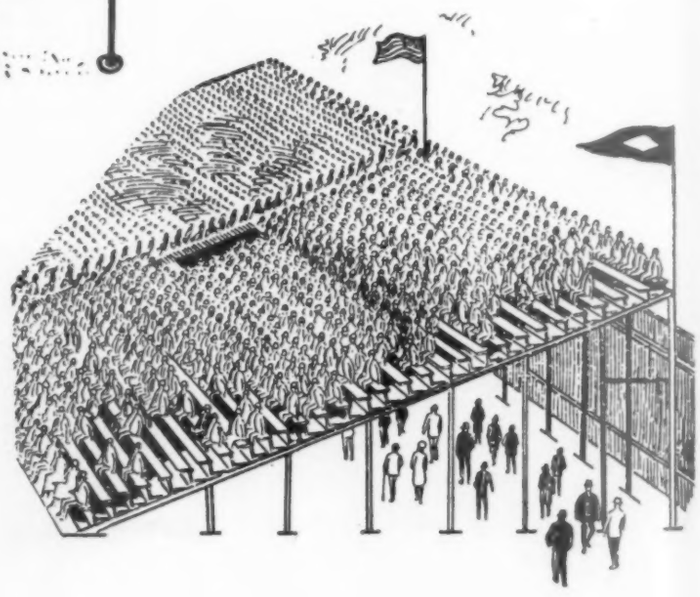


A restraining device that saves wear and tear on your field; keeps the crowds off the area; leaves the field free for action

Every Williams Grandstand is absolutely safe, practical and economical. In both the portable and permanent units, there is sufficient room between rows to permit free leg room. The rise between seatboards provides ample and unobstructed visibility. Every Williams Grandstand is constructed to hold four times the given load. There has never been an accident due to faulty construction! With proper care, Williams Stands will last as long as any modern school plant.



The stanchions are made up of 1" plate x 20" dia. and the rods welded to the plate are 36" high and have holes in them to take care of the ½" cable and should be spaced approx. 50' apart on the field. Spikes to be inserted in the ground are about 24" lg. ¾" Turnbuckles are used to tighten up the wire after it is in place.



IRON A.P. WILLIAMS INC. BRONZE CO.

WILLIAMS IRON WORKS, Inc. 442 E. 102 St., New York 29, N. Y.

UNIVERSAL BLEACHER COMPANY

608 South Neil Street, Champaign, Illinois

Manufacturers of "Roll-A-Way" and "Fold-A-Way" Gymnasium Stands & Portable Wood and Portable Steel Bleachers

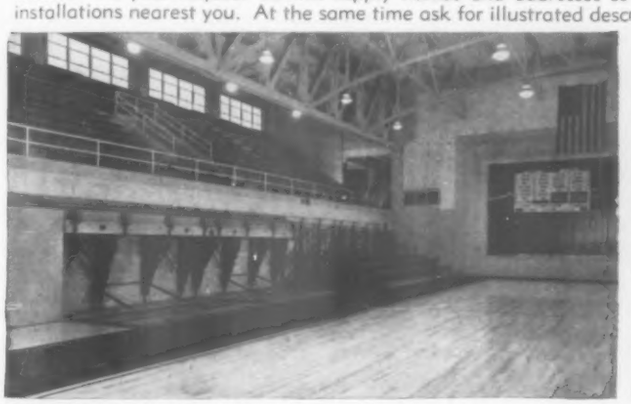
THE PRODUCT OF EXPERTS

UNIVERSAL Bleachers and Stands may be used on all types of athletic fields and for all styles of gymnasiums. Being the world's largest bleacher manufacturer, UNIVERSAL'S skill and integrity, gained over more than 30 years of pioneering in the field, insures trouble-free bleacher operation for many years. With safety uppermost in mind UNIVERSAL stands are made to meet, and exceed, the most rigid specifications for safety. As an added factor all seat boards are equipped with metal connectors eliminating lap joints, adding strength and avoiding possible danger of pinching or tearing of clothes. A type and style for every need is available.

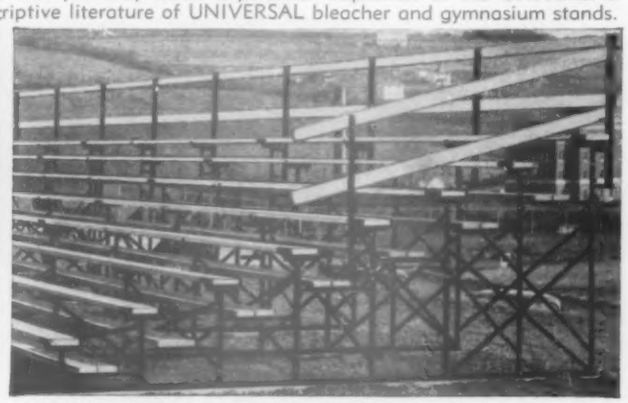
For gymnasiums UNIVERSAL provides "Roll-A-Way" and "Fold-A-Way" Stands; and for outdoor seating, Steel or Wood Portable bleachers. See illustrations below. Permanent stands for inside or outdoor use may also be had. Each stand is the product of experts, assuring superior design and operation; safe, sturdy construction, the utmost in space-saving features, and lasting satisfaction to the customer. We invite comparison.

HUNDREDS OF ENTHUSIASTIC USERS

UNIVERSAL seating in gymnasiums and on athletic fields is used by leading schools, colleges and universities throughout the nation. At your request we will supply names and addresses so that you may make a personal inspection of the UNIVERSAL installations nearest you. At the same time ask for illustrated descriptive literature of UNIVERSAL bleacher and gymnasium stands.



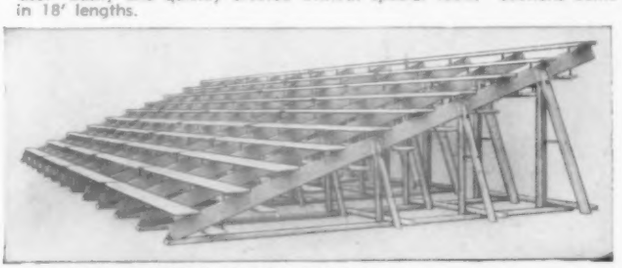
UNIVERSAL "Fold-A-Way" GYMNASIUM STANDS . . .
Built to fit individual seating needs. Compact and attractive. Allow greater saving of valuable floor space when not in use. Sections come in 14' to 16' lengths.



UNIVERSAL PORTABLE STEEL BLEACHERS . . .
Vertical legs give rigid support and strength. For indoor and outdoor use. Easily and quickly erected without special tools. Sections come in 18' lengths.



UNIVERSAL "Roll-A-Way" GYMNASIUM STANDS . . .
Capacity crowds can be comfortably and safely seated. Stands roll conveniently and compactly back to wall after use, providing considerably more floor space. Sections come in 14' to 16' lengths.



UNIVERSAL PORTABLE WOOD BLEACHERS . . .
Made of heavy, select materials and designed for ease and speed of erection. All wood members bolted to prevent splitting. Sections come in 15' lengths.

WRITE FOR ESTIMATES

Without charge or obligation our engineering department will prepare layout and specifications to fit your particular requirements and will quote estimates and budget figures to help you plan for durability, economy, safety and space saving. Because of the tremendous demands for UNIVERSAL Gymnasium Stands and Bleachers, we advise that you act now so that your name will be high on our early delivery list.

UNIVERSAL "Fold-A-Way" TABLE OF SIZES

Rows High	Depth Opened	Depth Closed	Space Gained	Height in Use	Height Closed
3	4' 8"	1' 8"	3' 0"	3' 0"	3' 0"
4	6' 6"	1' 11½"	4' 5½"	3' 11½"	3' 11½"
5	8' 4"	2' 3"	6' 1"	4' 11"	4' 11"
6	10' 2"	2' 6¼"	7' 7½"	5' 10½"	5' 10½"
7	12' 0"	2' 10"	9' 2"	6' 10"	6' 10"
8	13' 10"	3' 1"	10' 9"	7' 9½"	7' 9½"
9	15' 8"	3' 5"	12' 3"	8' 9"	8' 9"
10	17' 6"	3' 8"	13' 10"	9' 8½"	9' 8½"

Space occupied by Roll-A-Way is approximately the same as above table

UNIVERSAL "Steel Portable" TABLE OF SIZES

Number of Rows	3	4	5	6	7
Depth front to back	4' 10"	6' 10"	8' 10"	10' 10"	12' 10"
Height of top row	2' 8"	3' 4"	4' 0"	4' 8"	5' 4"
Seating cap. per 18 ft.	39	52	65	78	91

Number of Rows	8	9	10	11	12
Depth front to back	14' 10"	16' 10"	18' 10"	20' 10"	22' 10"
Depth of top row	6' 0"	6' 8"	7' 4"	8' 0"	8' 8"
Seating cap. per 18 ft.	104	117	130	143	156

UNIVERSAL "Wood Portable" TABLE QF SIZES

Tiers High	STANDARD TYPE Height	STANDARD TYPE Depth Front to Back	EXTENDED TYPE Height	EXTENDED TYPE Depth Front to Back	Seating Capacity per 15 ft. Section
2	1' 10"	3' 2"	1' 11"	3' 5"	22
3	2' 6"	4' 5"	2' 8"	4' 11"	33
4	3' 1"	6' 4½"	3' 4"	7' 1½"	44
5	3' 9"	8' 1"	4' 1"	9' 1"	55
6	4' 4"	9' 6"	4' 9"	10' 9"	66
7	4' 11"	11' 2"	5' 5"	12' 8"	77
8	5' 6"	13' 2"	6' 1"	14' 11"	88
9	6' 2"	14' 9"	6' 10"	16' 9"	99
10	6' 9"	16' 6"	7' 6"	18' 9"	110
11	7'	18' 2"			121
15	9' 10"	24' 8"			165
*33	12' 4"	56' 8"			363

CROUSE-HINDS COMPANY

ESTABLISHED 1897

Syracuse 1, N. Y., U. S. A.



Type MDB Light Duty Floodlight with removable steel stake for temporary ground mounting



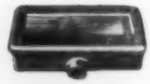
Type MUA Alumalux Floodlight provides adequate light at minimum first cost



Type GCP, an ornamental lantern by day, a powerful floodlight at night



Type ADE Heavy Duty Long Range Floodlight gives perfect light control and low maintenance cost



Type FS for low-level lighting of steps, floors, walks and gardens

FLOODLIGHTS
for sports and campus lighting

Sports Lighting

Pioneer in sports lighting, Crouse-Hinds has a wealth of experience acquired through more than twenty years of planning the most efficient lighting for all types of playing fields from small playgrounds to huge stadiums. This "know how," teamed up with Crouse-Hinds Type MUA Alumalux Weatherproof Floodlight forms an unbeatable combination that you can use to get the greatest amount of light out onto your playing field — where it does the most good.

Swimming Pools

Type SPS Floodlight is especially designed for the underwater lighting of both indoor and outdoor swimming pools. Three different types of Crouse-Hinds floodlights are suitable for the overhead lighting of outdoor swimming pools: Type MUA Alumalux, Type ADE Long Range, or Type GCP Ornamental Lantern Floodlights.

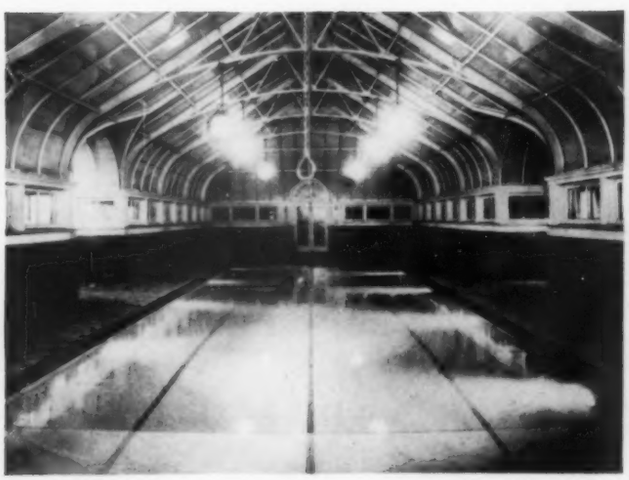
Decorative Campus Lighting

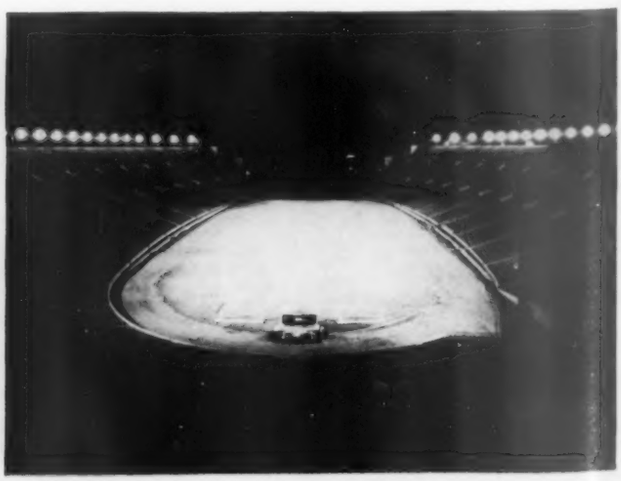
There are many opportunities to make any campus more attractive by using concealed Crouse-Hinds floodlights to project either white or colored light on fountains, gardens, statuary, towers or other architectural details. When the floodlight is in the line of vision, beauty can be combined with utility by using Type GCP Ornamental Lantern Floodlight. Type FS Lighting fixture is suitable for low-level lighting.

General Floodlighting

Auto parking lots are most efficiently lighted by the use of floodlights. There are many other areas on every campus where it will cost much less to project light to a considerable distance with Crouse-Hinds long range floodlights than to run cables and install local lighting. Often the floodlights can be mounted on buildings, thereby saving the cost of poles or towers.

Crouse-Hinds lighting engineers will recommend the proper selection and arrangement of floodlights for any application. Send drawings and details. Bulletins covering NEMA standard plans for the lighting of baseball, football and softball fields are available.





GENERAL ELECTRIC COMPANY

Schenectady 5, N. Y.

"LIGHTS ON" says Larry MacPhail



"New G-E engineered installation to make Yankee Stadium best lighted ball park in U.S.," says pioneer in night baseball, now President, N.Y. Yankees

Installation of new type floodlights developed by General Electric will pave the way for the "brightest" night baseball ever played. Six roof frames will support 1245 Type L-69 floodlights (approximately 2200 kw) to provide uniform 200 foot-candle illumination over the entire 3¼ acre playing field —a level nearly twice as bright as any other major league park.



Larry MacPhail inspects new Yankee Stadium floodlight

NOW YOU CAN HAVE THE ADVANTAGES OF THIS *New Floodlight*

You Get All These ADVANTAGES in the New G-E Type L-69 Floodlight

- Rifle-sight aiming, for spotting center of beam, insures accuracy, permits setting in daytime
- Impact-resisting, spun-in cover glass seals out moisture, dirt and insects
- Approximately 10% greater beam efficiency compared with former types
- Saves time in installation and servicing, requires less cleaning
- Requires no tools for servicing
- More light for the operating dollar

BASEBALL • BASKETBALL • SKATING • HOCKEY • RACE TRACKS • BOXING • TENNIS • FOOTBALL • SOFTBALL • SWIMMING • SKEET • GOLF DRIVING • RIFE RANGE • SKIING • PARKING

Here's real news for everyone interested in after-dark sports—for the new G-E Type L-69 floodlight, which was used initially for this outstanding installation, will be just as effective when used for smaller baseball fields, football fields, and any other sports areas.

The new floodlight introduces many new features that will improve lighting efficiency and reduce your lighting costs. The complete socket housing is removable from the rear for easy servicing and lamp replacement, eliminating the need for disturbing the reflector setting in normal maintenance. The impact-resisting glass cover is spun-in for tight-sealed protection against weather, dirt and insects. Rifle sights assure quick, accurate aiming of the beam and allow final adjustments during daytime.

G-E Type L-69 floodlights are designed for lamps of 750 to 1500 watts. Two reflector finishes provide either medium or wide beams to obtain uniform illumination of areas of any size or shape.

If you are considering a floodlighting installation for your sports and recreation program, we suggest that you get in touch with your nearest G-E sports lighting specialist before you make your plans. He has complete data on lighting plans, layouts, methods of mounting and wiring, and recommended servicing practice for your use and guidance. Or you may wish to write for our Bulletin GEA-4590, Apparatus Dept., General Electric Co., Schenectady 5, N. Y.

AURORA STEEL PRODUCTS COMPANY

Aurora, Illinois

AURORA Steel Lockers and Storage Cabinets have been accepted throughout the nation as the Standard for Quality and Workmanship. The growing popularity of our equipment, for the past thirty years, confirms this statement. Installations in America's finest schools.

AURORA Steel Lockers and Cabinets are not only the Standard for Quality, they are the Standard for Beauty. They are modern in design and fittings and finished with the finest quality baked enamel with a protective coat of lacquer.



Illustrating Type SL Single Tier Locker. A type or size can be furnished to meet any need in both free standing or recessed lockers. Call on our engineering staff for layouts and plans for your next installation.



Illustrating the 36 x 18 x 78 Inch Storage Cabinet. Larger or smaller cabinets are also available. Can be furnished in combination storage and wardrobe or wardrobe cabinets only. Standard finish, Olive Green. Special finish at a small extra cost.

★ ★ ★

WRITE OR WIRE FOR INFORMATION OR NAME OF NEAREST DEALER. REPRESENTATIVES IN ALL PRINCIPAL CITIES

BERGER MANUFACTURING DIVISION

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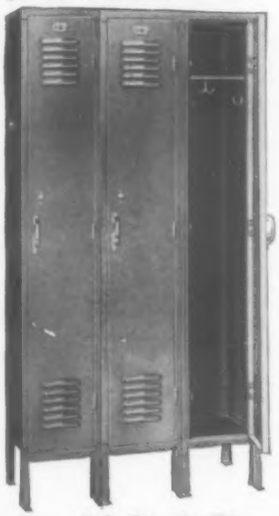
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STEEL LOCKERS **OFFICE EQUIPMENT** **STORAGE SHELVING** **SHOP EQUIPMENT**

Berger Steel Equipment is manufactured by an organization with sixty years' experience in making equipment for the modern school and university. Berger equipment is built to meet the most rigid requirements for durability, utility and structural perfection. All items are quickly available in practically every size and type. Experienced Berger engineers will be sent anywhere without charge to assist architects, builders or purchasing agents in planning new installations.



The single tier standard louvre is the most popular general purpose locker

Type S.S. Single Tier

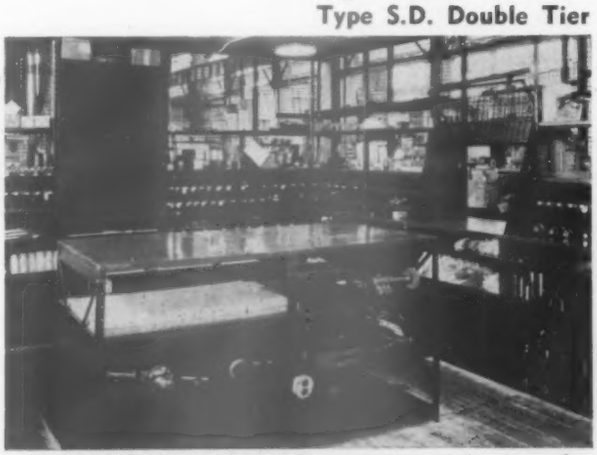


A double tier standard louvre locker. Send for Catalog No. EL-561

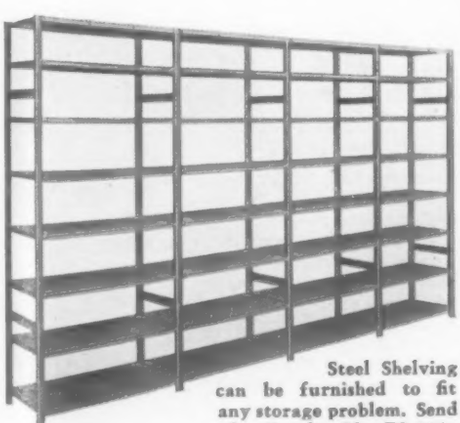
Type S.D. Double Tier



Berger Classroom Wardrobes provide for efficient handling of pupils' clothing. Send for Catalog No. EW-566



Berger Steel Storage and Tool Room Equipment has been designed by engineers qualified by years of experience with storage problems



Steel Shelving can be furnished to fit any storage problem. Send for Catalog No. ES-580

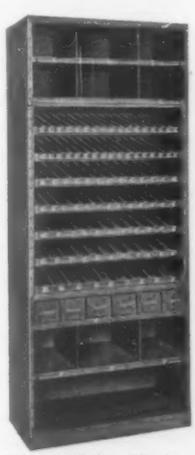
Berger Open Type Shelving



Work Bench

Berger benches are available in many combinations. Send for Bulletin No. ET-587

When many small items must be stored and protected, Berger Flexi-Bilt units offer many advantages not found in any other type of construction. Send for Catalog No. ET-587



Flexi-Bilt Units

DURABILT MFG. CO.

619 Arnold Avenue, Aurora, Ill.

SALES OFFICES IN ALL PRINCIPAL CITIES

SINGLE TIER LOCKERS



Single Tier

Single Tier lockers provide service in a most convenient form. They are available in the practical heights of 60 or 72 ins. and in various widths and depths.

A Single Tier locker of small dimensions, say 12 ins. wide, 12 ins. deep and 60 ins. high (not including the legs), capably takes care of any ordinary requirements for individual use. The size of the locker, however, should be increased in such cases as school "team" rooms, gymnasiums, etc., in order to make the storing of athletic uniforms, equipment, etc., more convenient. The Single Tier locker is regularly provided with a hat shelf. Because this shelf decreases the space for hanging clothes, authorities generally prefer the 72-in. locker, for the average use, better than the 60-in. locker. Space limitations determine, of course, the size and number of the Single Tier lockers to be installed, but competent planning and careful use of available floor space will reveal the surprising adaptability of this type of locker to orderly and efficient locker rooms.

Standard equipment for Single Tier lockers includes the hat shelf, one double prong ceiling hook and three or more single prong side hooks, depending on size of locker. Equipment can be varied to meet individual requirements.

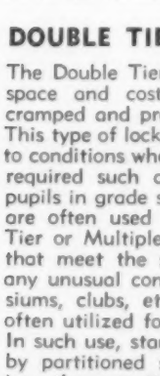
DOUBLE TIER LOCKERS

The Double Tier locker is economical as to space and cost. Necessarily, it is more cramped and provides less storage capacity. This type of locker, however, is ideally suited to conditions where large storage space is not required such as for smaller and younger pupils in grade schools. Double Tier lockers are often used in combination with Single Tier or Multiple Tier lockers to form units that meet the storage problems of almost any unusual condition. In schools, gymnasiums, clubs, etc., Double Tier lockers are often utilized for the storage of gym shoes. In such use, standard equipment is replaced by partitioned shoe compartments, 6 x 6 ins.; the capacity is from 10 to 18 compartments per locker, according to locker size. While 6 x 6 ins. is the accepted size for shoe compartments, other sizes that work out on multiples can be furnished. Single Tier lockers may also be thus utilized.



Double Tier

Standard equipment is the same as for Single Tier lockers, with the hat shelf omitted.



Multiple Tier (Box)

MULTIPLE TIER (BOX) LOCKERS

Multiple Tier (Box), or small compartment lockers as they are sometimes called, have a wide field of usefulness. They can be used to advantage wherever small storage space is required. In schools, gymnasiums, clubs, etc., they are ideal for storing gym suits and shoes, books, lunches, etc. In factories, offices, stores, etc., they are widely used for storing small tools, work shoes, overalls, etc. In combination with Single Tier or Double Tier lockers, they are especially popular.

Like all Durabilt Lockers, they can be furnished for recessing in walls, in single row for arrangement along the walls or in double row or back to back arrangement. They come in tiers three or more high and as many lockers wide as space or requirements permit. No shelves or hooks are furnished with Multiple Tier (Box) lockers.

GYMNASIUM LOCKERS

While in many schools, clubs, lodges, etc., having gymnasiums the average requirements can be taken care of by Double and Multiple Tier lockers arranged according to conditions, the modern trend is toward a combination arrangement shown in the illustration. This type is usually termed "Gymnasium Locker Unit." A complete unit consists of one standard Single Tier locker in combination with double tier lockers, two high, in sections two, three or four wide. Multiple Tier (Box) lockers can be added, of course, to suit individual requirements.



Gymnasium Locker Unit

Standard equipment consists of one hat shelf in large compartments. All compartments have one double prong ceiling hook and three or more single prong side hooks depending on size of locker. Various combinations consisting of Single Tier lockers, Double Tier lockers, two or three high and Multiple Tier lockers can be made up.

GYMNASIUM LOCKER SIZES

(Dimensions are in inches)

Larger Compartments W. D. H.*	Small Compartments
12x12x60	6 x12x30 Double Tier Arrangement
12x15x72	6 x15x36 Double Tier Arrangement
15x15x60	7½x12x30 Double Tier Arrangement
15x15x72	7½x15x36 Double Tier Arrangement
	9 x12x20 Triple Tier Arrangement
	9 x15x24 Triple Tier Arrangement

* Overall height, including legs, is 6 ins. greater.

LOCKER ROOM BENCH TOPS AND PEDESTALS

Quite often, customers want to purchase their locker room benches locally, while others prefer that we furnish them. In order to extend complete service to our customers we are prepared to furnish Bench Tops and Pedestals as follows:



Locker Room Bench (Bench Top and Pedestals)

BENCH TOPS

Yellow pine seems to be the most popular wood for locker benches and, unless otherwise specified, we will always furnish it. Our bench tops are carefully sanded with rounded corners and edges, and finished with one coat of shellac and one coat of varnish. Ordinarily, tops are furnished in 6, 8, 10 or 12 ft. lengths, either 8, 10 or 12 ins. wide and 1½ or 2 ins. thick (Dimensions are nominal.)

BENCH PEDESTALS

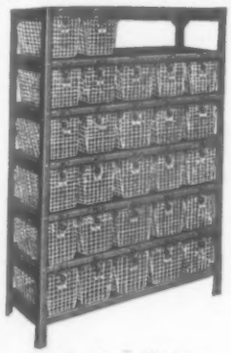
These strong and rigid pedestals are of our special design. They are made with heavy cast iron base and top approximately 7 ins. in diameter, and a strong tubular column 1½ ins. in diameter. There are four holes in the base and four in the top for attaching to floor and bench. Finish is baked-on black japan. Pedestal weighs approximately 7 lbs. Standard overall height is 16½ ins. but other sizes can be furnished. Pedestals should be placed 1 ft. from each end of bench top and not more than 5 ft. apart. When ordering, always give size of benches and quantity of pedestals required.



Pedestal

TYPES OF DURABILT STEEL LOCKERS

BASKET RACKS AND TRUCKS



Single Row, Skeleton Type Rack



Double Row, Solid Ends Truck

The use of steel racks and wire baskets is often preferred to Multiple Tier (Box) lockers. This system is less expensive and gives the advantages of complete ventilation and makes the contents visible for inspection at any time. The security and orderly appearance of the box lockers is, of ourse, sacrificed to some extent. The illustration at the left shows the single row, skeleton type, Basket Rack with baskets in place. This rack has a capacity of 30 baskets and consists of steel shelves with angle uprights, basket separators and padlock hasps which permit locking of the baskets in place. The illustration at the right shows the double row Basket Truck, built with solid ends and casters instead of legs, for portability. Basket Racks can be furnished with legs or without legs, the latter arrangement for the purpose of setting the racks up permanently on cement or terrazzo bases. They can be set up in single row arrangement or built for double row arrangement. Racks may vary to accommodate 30 to 48 baskets each; Trucks, 60 to 84 baskets each.

BASKET RACKS

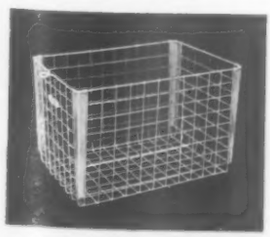
Capacity		W. D. H.
30 baskets 8½x13x8½"	(5 wide x 6 high)	47x13½x61¼"
35 baskets 8½x13x8½"	(5 wide x 7 high)	47x13½x71¼"
40 baskets 8½x13x8½"	(5 wide x 8 high)	47x13½x81¼"
36 baskets 8½x13x8½"	(6 wide x 6 high)	56x13½x61¼"
42 baskets 8½x13x8½"	(6 wide x 7 high)	56x13½x71¼"
48 baskets 8½x13x8½"	(6 wide x 8 high)	56x13½x81¼"
30 baskets 11½x13x8½"	(5 wide x 6 high)	62x13½x61¼"
35 baskets 11½x13x8½"	(5 wide x 7 high)	62x13½x71¼"
40 baskets 11½x13x8½"	(5 wide x 8 high)	62x13½x81¼"

Heights listed above do not include 4¾-in. legs.

BASKET TRUCKS

Capacity	W. D. H. Overall
60 baskets 8½x13x8½" ..... 5 wide x 6 high Double Row.	47x27x65"
84 baskets 8½x13x8½" ..... 6 wide x 7 high Double Row.	56x27x75"
60 baskets 11½x13x8½" ..... 5 wide x 6 high Double Row.	62x27x65"
84 baskets 11½x13x8½" ..... 6 wide x 7 high Double Row.	74x27x75"

WIRE BASKETS



Because of the rough treatment wire baskets receive, we recommend the exceptionally strong basket illustrated, for use in Durabilt Basket Racks and Trucks. It is made of 1 in. square mesh No. 16 gauge wire, with 3/16-in. top frame and formed steel angle reinforcements at corners. To prevent rust, baskets are finished with a heavy coating of tin after manufacture. Pinched padlock loop in top frame holds basket in line with front of shelf when padlock is attached. A brass, satin nickel finished number plate is riveted on one end approximately 2 ins. from top edge.

Standard sizes are: 8½ ins. wide x 13 ins. deep x 8½ ins. high; 11½ ins. wide x 13½ ins. deep x 8½ ins. high. Can be furnished in ¾ and 1 in. mesh.



Two-in-One

TWO-IN-ONE LOCKERS

W. D. H.*	W. D. H.*
15x12x60"	15x15x72"
15x15x60"	15x18x72"
15x18x60"	15x21x72"
15x12x72"	

Equipment consists of two hat shelves, vertical partition dividing lower part into two coat compartments each having one double prong ceiling and two or more single prong side hooks, depending on size of locker. Can be furnished without partition when desired.

* Overall height, including legs, is 6 ins. greater.

TWO PERSON LOCKERS

W. D. H.*
15x15x72" without coat rod
15x18x72" with coat rod
15x21x72" with coat rod

Coat compartments are 7½ ins. wide by 54 ins. high. Hat compartments are 15 ins. wide by 9 ins. high, making total height of section 72 ins. **exclusive of legs.**

EQUIPMENT—One double prong ceiling hook and two or more single prong side hooks, depending on size of locker. Lockers 18 ins. deep and over have a coat rod in addition to hook equipment.



Two Person

DUPLEX LOCKERS

W. D. H.*
15x15x72"
15x18x72"
15x21x72"

Two lockers in special 15-in. wide frame. Each locker 7½ ins. wide. Provides 2835-cu. in. capacity in 18-in. deep locker.

EQUIPMENT—One hat shelf spaced 21 ins. down from top, one single prong coat hook above shelf; one double prong ceiling hook bolted to shelf and two or more single prong hooks below shelf. Coat rods can also be furnished. Requires only two locks. Very economical and conserves floor space.

SCHOOLS AND GYMNASIUMS

For clothing storage, the Durabilt Lockers best suited to schools and gymnasiums are the specially equipped full length or Single Tier lockers either recessed in the walls, on concrete bases, or free standing on legs. Where Single Tier lockers are not desired, we recommend the use of Double Tier Lockers. Multiple Tier Lockers, or "Box" Lockers are ideally adapted to storage of gym suits, books, sewing materials, etc. Combinations of any of these types, are of course, available. Durabilt Basket Racks and Trucks for gymnasiums, pools, etc., furnish well ventilated, and secure storage facilities.



Duplex

FRED MEDART MANUFACTURING CO.

Potomac and Dekalb Streets

Saint Louis, Mo.

ENGINEERING AND SALES SERVICE IN ALL PRINCIPAL CITIES

MEDART STEEL LOCKERS

LOCKER CONSTRUCTION

Design—Built on "unit principle" each locker having its individual door, frame, top, bottom, etc., all parts interchangeable.

Doors—Made of 16-gauge steel, reinforced by flanging top and bottom edges, and channelling side edges.

Frames—Made of 16-gauge steel, formed into channel shape with rolled inner edge. Upright and cross members electrically welded together, making a true, square and rigid frame.

Body of Locker—The backs, sides, tops and bottoms are made of 24-gauge steel.

Locking Device—Three-point rubber-cushioned contact in single-tier lockers; two-point contact in double-tier lockers. Doors are pre-locking self-latching type.

Door Handle—Lift type with concealed padlock eye.

Locks—As selected from Catalog.

Hinges—36- and 42-in. doors hung on two hinges; 60-in. doors on three hinges; 72-in. doors on four hinges. Hinges electrically spot-welded to frame and bolted to side flange of door with two bolts. Bolts equipped with lock washers.

Legs—Adjustable front legs to overcome floor irregularities. According to width of lockers and grouping, legs are spaced 30 to 36 in. apart with a clearance of 4⅞ in. above floor.

Cabinet Base—An extra 4⅞-in. cabinet base can be furnished at an additional charge.

Ventilation—All standard locker doors are louvred at top and bottom to provide ventilation—three louvres top and bottom for 36- and 42-in. lockers, six louvres top and bottom for 60-in. lockers and nine for 72-in. lockers. Box lockers, three louvres. (Round hole perforations can be substituted for louvres at no additional cost.)

Standard Finish—School Furniture Brown, or Olive Green. All parts are thoroughly cleaned before enameling; enamel is baked on to hard finish.

Hooks—Made of steel, cadmium plated. Lockers 12 and 15 in. deep have three single-prong wall hooks and one double-prong ceiling hook; lockers 18 in. or more in depth have five single-prong wall hooks.

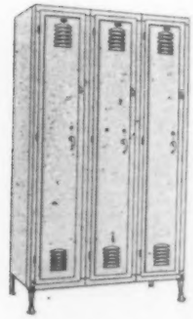
Coat Rods—Standard equipment on all lockers 18 in. or more in depth and on all two-person lockers.

Shelves—Single-tier lockers have shelves extending the full depth and width of lockers. Shelves have rolled front edge and are bolted to sides. Double-tier lockers do not have shelves. Extra shelves can be provided.

Tops—All lockers have individual flat tops. Sloping tops can be furnished at extra cost.

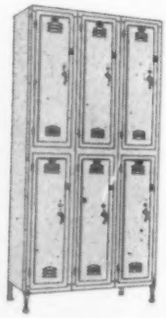
Numbering—All lockers are furnished with aluminum number plates to be bolted in place. Unless otherwise specified lockers are numbered consecutively from "one" up.

LOCKER SIZES



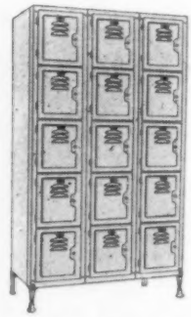
Single Tier Lockers

Wdth.	Dpth.	Hght.
12″	12″	60″
12″	15″	60″
12″	18″	60″
15″	15″	60″
15″	18″	60″
12″	15″	72″
12″	18″	72″
15″	15″	72″
15″	18″	72″
18″	18″	72″
18″	21″	72″



Double Tier Lockers

Wdth.	Dpth.	Hght.
12″	12″	30″
12″	12″	36″
12″	15″	36″
12″	18″	36″
15″	15″	36″
12″	12″	42″
12″	15″	42″
15″	15″	42″



Box Lockers

Wdth.	Dpth.	Hght.	Tiers
12″	12″	12″	5
12″	12″	12″	6
12″	15″	12″	5
12″	15″	12″	6
15″	15″	12″	5
15″	15″	15″	4
18″	18″	12″	5
18″	18″	12″	6

Also Gym Suit Lockers and Two-Person Lockers

To quote prices we must have the following information: Number of lockers of each size, number that are single row (wall type), number that are double row (back to back), number to be recessed and amount of trim required, color, catalog number of locks desired, and point of delivery.

SHELVING FOR WIRE BASKETS



Illustration shows a section of wire basket shelving seven baskets high (6 ft. 0 in.) with basket dividers and padlocking arrangement for self-service. Shelving sections nine baskets high (7 ft. 6½ in.) for use in attendants' rooms can also be furnished.

A section for either 13 x 9 x 8-in. or 13 x 12 x 8-in. baskets is 40 in. long and 13¾ in. deep, accommodating four small or three large baskets to each shelf. This shelving is of rigid open construction, providing maximum ventilation for baskets. Dividers as shown in illustration are standard equipment. An aluminum number plate for each basket space is provided. Finished in School Furniture Brown, or Olive Green Enamel.

Also: Trucks for Wire Baskets—made up of two standard steel shelving sections bolted back-to-back, cross-braced for rigidity, and with anti-friction steel rollers.

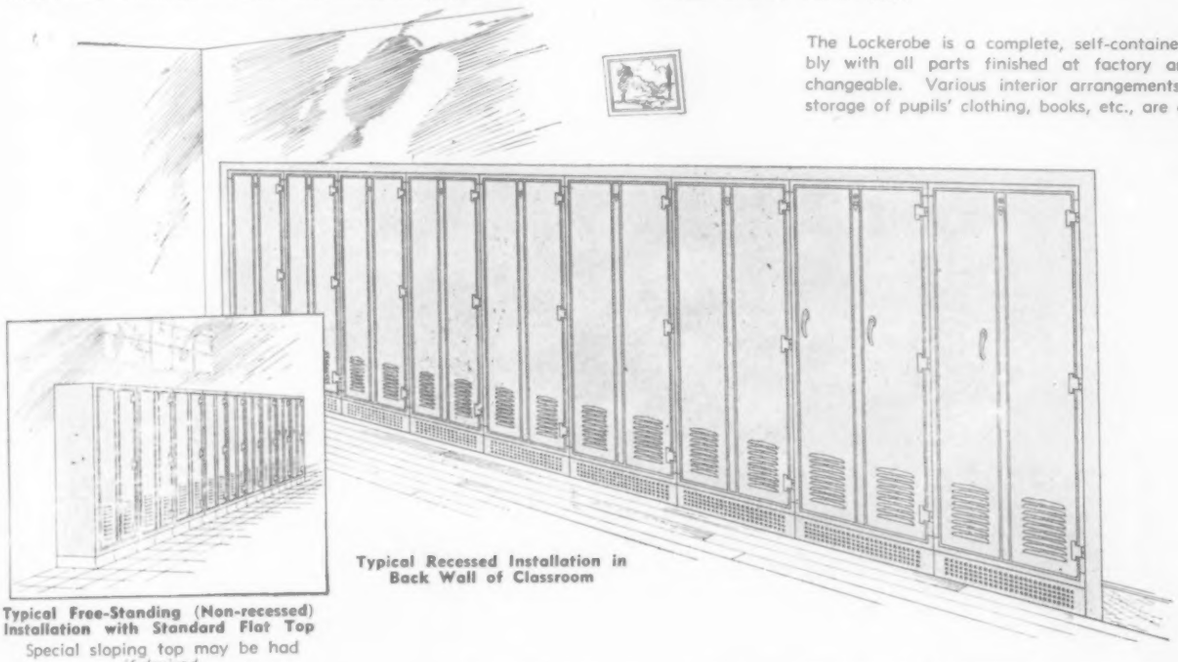
WIRE BASKETS

Body of 15-ga. wire, with 6-ga. top frame and 13-ga. corners. "X" braced bottom; aluminum number plate. Two sizes in both standard 1" and special ¾" mesh: 13 x 9 x 8" and 13 x 12 x 8".

MEDART LOCKEROBES

A Lockerobe classroom assembly consists of a multiple of pupil units, each unit having one pair of doors. All doors are opened or closed by one person (teacher or monitor) from one point. The right hand door of control unit operates all right hand doors; the left hand control unit door operates all left hand doors, thus eliminating any need for children of elementary school age to operate the doors of the individual units. School officials approve this feature which eliminates possibility of injury, noise and confusion in the classroom and needless delay, in bringing the class to order, or upon dismissal. A simple door operating mechanism eliminates future maintenance problems.

Constructed entirely of steel, the Lockerobe is sanitary, fire-resisting, termite-proof, and easy to keep clean. When recessed, Lockerobes require a recess depth of only 16 in. This dimension when contrasted to depth required by conventional type wardrobes represents an unusual opportunity to reduce classroom cubage and cut building costs. Lockerobes also serve as an important adjunct to room ventilation systems. Air can be withdrawn through grille base and after passing between back of units and recess wall, can be expelled through conventional exhaust fan or duct.



The Lockerobe is a complete, self-contained assembly with all parts finished at factory and interchangeable. Various interior arrangements for the storage of pupils' clothing, books, etc., are available.

Typical Recessed Installation in Back Wall of Classroom

Typical Free-Standing (Non-recessed) Installation with Standard Flat Top
Special sloping top may be had if desired

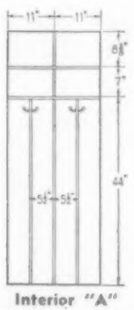
Lockerobe Auxiliary Units

Bookcases, Teachers' Wardrobes and Combination Bookcases and Wardrobes furnished in 22-in. widths. To determine over-all length of classroom assembly and of recess required, where one or more auxiliary units are required, add the actual width of auxiliary units to the above pupil unit and recess dimensions.

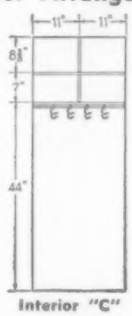
Number of 22-in. Pupil Units required	Over-all length of assembly	Length of recess required
2	3 ft. 8 in.	3 ft. 11 in.
3	5 ft. 6 in.	5 ft. 9 in.
4	7 ft. 4 in.	7 ft. 7 in.
5	9 ft. 2 in.	9 ft. 5 in.
6	11 ft. 0 in.	11 ft. 3 in.
7	12 ft. 10 in.	13 ft. 1 in.
8	14 ft. 8 in.	14 ft. 11 in.
9	16 ft. 6 in.	16 ft. 9 in.
10	18 ft. 4 in.	18 ft. 7 in.

Each 22-in. pupil unit will accommodate 4, 5, or 6 pupils, depending on the interior arrangement selected. (See below.)

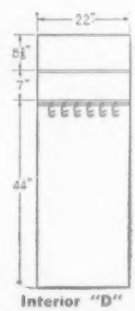
Interior Arrangements



Interior "A"
Each unit accommodates 4 pupils. Provides 4 individual hat compartments and 4 individually partitioned coat compartments.



Interior "C"
Each unit accommodates 4 pupils. Provides 4 individual hat compartments, coat rod and 4 sliding double-prong coat hooks.



Interior "D"
Each unit accommodates 6 pupils. Provides 2 full width shelves, coat rod, and 6 sliding double-prong coat hooks.

MEDART ENGINEERING SERVICE

A competent staff of Medart engineers is available to help you plan and lay out the most efficient and economical installation of equipment to meet your own special requirements. No obligation.

MEDART CATALOGS WILL BE FURNISHED UPON REQUEST

LYON METAL PRODUCTS, INCORPORATED

General Offices: Aurora, Illinois

BRANCHES AND DEALERS IN ALL PRINCIPAL CITIES

LYON STEEL SCHOOL EQUIPMENT

STEEL LOCKERS



Single tier lockers are the most practical and widely used of all lockers. Heights permit full length clothing storage. Shelf 8½" from top for storing hats, lunches, etc. Lockers 12" wide and have one double and three single prong coat hooks. Lockers over 12" wide have one double prong and four single prong coat hooks.

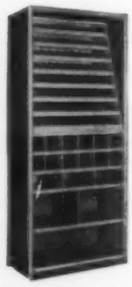


Economical as to cost per unit and storage area required. Satisfactory for a great many uses—particularly for short period occupancy and where long coats are not worn. Double tier lockers are not equipped with shelves.



Lyon multiple lockers are made in six, four and three tier high models. They have a wide variety of uses for the storage of individual belongings and supplies in classrooms, laboratories, gymnasiums, bowling alleys, vocational schools, etc. Available with either padlock attachment or built in lock.

TOOL STORAGE EQUIPMENT



Units for all types of tool storage. Shelving available in open, closed, bin, tool and counter models.

DRAWING TABLE



Designed to accommodate 4 drawing classes per day. Bottom opening in lockers provides storage for standard drawing boards. Padlock hasps permit doors to be securely locked. Flange on front edge holds drawing board in position.

WOOD WORKING BENCH



Available in single and double face models to accommodate 6 and 12 students per day. Doors equipped with padlock attachment. Heavy duty wood top with attachments for vises.

A COMPLETE LINE OF

Tool Stands	Tool Toters
Stools	Bar Racks
Work Benches	Shelving
Shop Boxes	Lockers
Desks	Cabinets
Welding Benches	Folding Chairs

Conveyors

Domestic Science Kitchen Cabinets

SHEET METAL WORK BENCH



Furnishes a large solid working area and shelf storage for metal sheets and stakes. Top made of hard maple or birch with natural finish.

CABINETS



Steel cabinets are available in storage (illustrated) combination and wardrobe models. Storage model is equipped with four adjustable shelves. Tamper - proof grooved key lock. Finished in green baked enamel.



This combination cabinet is equipped with one wardrobe shelf and coat rod; partition and four storage half shelves adjustable on 2" centers. Rounded front edges, exclusive design and construction combine to present steel cabinets of modern appearance and durability.

FOLDING CHAIRS



Available in four models. Plain steel, metal cane, wood seat-steel back and upholstered seat and back.



For recreation rooms, auxiliary classrooms, shop seating, cafeterias, meeting rooms. Wide deep, curved seats, form fitting backs assure maximum seating comfort.



Chairs available in Lyon green, Flat Walnut and Taupe. Upholstered models finished in any standard color with either fawn or maroon upholstering. Tablet arms and ganging equipment available for all models.

PENN METAL CORPORATION OF PENNA.

48 Oregon Avenue, Philadelphia 48, Pa.

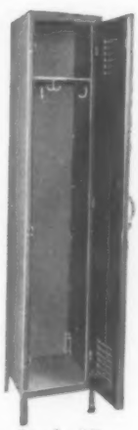
IN BUSINESS CONTINUOUSLY SINCE 1869

67 West 44th Street
NEW YORK 18, N. Y.

1869 Penco

200 W. Saratoga Street
BALTIMORE 1, MD.

STEEL LOCKERS -- STORAGE and WARDROBE CABINETS
STEEL SHELVING -- TOOL UNITS -- METAL SPECIALTIES



Single Tier Locker
Type 50-U-2



Box Lockers
Type 40



Eight-Compartment Locker
Type 82



Two-Person Lockers
Type 734



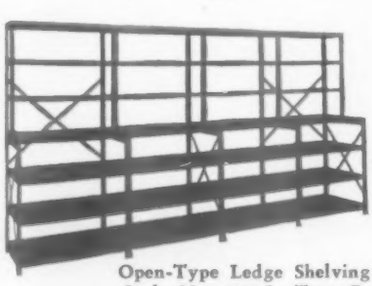
Wardrobe Cabinet
Type 3618-W

STEEL LOCKERS

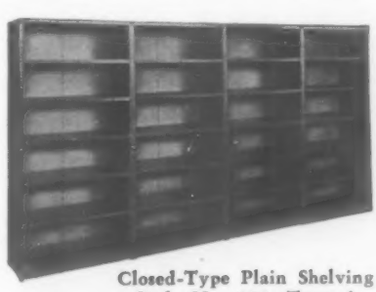
Penco single tier, double tier, box and multiple lockers of various types provide the complete storage facilities needed by all schools. Catalog No. 46 contains specifications, construction details and space-saving suggestions. Write for your copy.

STEEL CABINETS

Manufactured in many styles and sizes for wardrobe, storage or combination use.



Open-Type Ledge Shelving
Style No. 117-L, Type B



Closed-Type Plain Shelving
Style No. 118, Type A



Closed-Type Ledge Shelving
Style No. 119-L, Type A

STEEL SHELVING

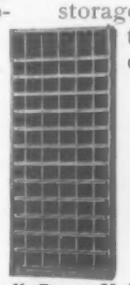
There are six basic types of Penco Steel Shelving which, with readily added accessories, provide protection and security for any commodity that requires storage. Catalog No. 45 contains detailed specifications and construction details. Write for your copy.



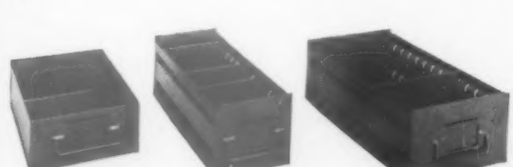
Steel Table No. 651



Steel Counter No. 652



Small Parts Unit
No. 154



Special Steel Boxes

Many prominent schools, clubs and industrial plants have been equipped with **Penco Standard Products** which are specified by architects for their durability and high standard of workmanship. They are known throughout the trade as the best that money can buy.

Write for the complete Penco Catalogs. Keep them in your post-war planning file.

DUDLEY LOCK CORPORATION

Chicago 6, Illinois

AS THE PIONEER in the use of combination padlocks for schools, Dudley has developed a type of locking equipment that has resulted in a simplified easy control, trouble-free locker system operation. Dudley locks are used by the majority of schools because they give extra service, extra protection and extra value.

SPECIFY DUDLEY

Dudley masterkeyed locks are made with exclusive Bell-type pin tumbler, pick-resistant cylinder. The famous Bell Key affords greater protection against duplication because it is not made on the commercial key making machine.



RD-2 ROTODIAL. A strong durable lock for lockers, scientifically tested, eliminates pilferage, is fool-proof, locks automatically disarranging all tumblers and dial.



RP-5 ROTOPOINT. A sturdily constructed lock for lockers. Locks when shackle is pushed into the lock case, disarranging all tumblers.

★

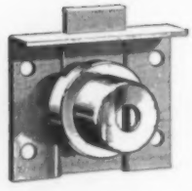


S-540. Masterkeyed combination lock for lockers with automatic latch release. Locks automatically disarranging tumblers and dial. Combination instantly changed with special reset key without removing any part of lock from locker.

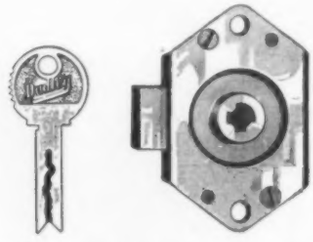


P-570. Self-locking. Tumblers and dial disarranged on opening and dial moved to a new position. Masterkeyed alone or in the same series as other Dudley masterkeyed locks.

★



W-510. Key lock for wood drawers and cabinets 7/8" and 1 1/8" thickness. Keyed different or alike. Masterkeyed alone or in same series with other Dudley masterkeyed locks.



S-530. Key lock for lockers and steel cabinets. Keyed different or alike. Masterkeyed alone or in same series with other Dudley masterkeyed locks.



AL-4. Masterkeyed combination lock for lockers with automatic latch release. Combination readily changed.

Different types of masterkeyed locks—S-540, P-570, S-530, W-510—used on different kinds of equipment in the same department can be furnished under the same master, if desired, simplifying supervision and control.

Dudley Keyless Lock

Dudley representatives are lock specialists experienced in the school lock field. They are competent to make a survey of the locking requirements and to recommend a system that will meet your needs. **Write us today!**

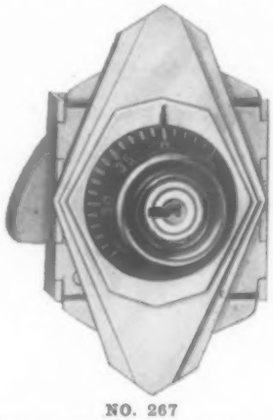
NATIONAL LOCK COMPANY

Rockford, Illinois

BRANCH OFFICES

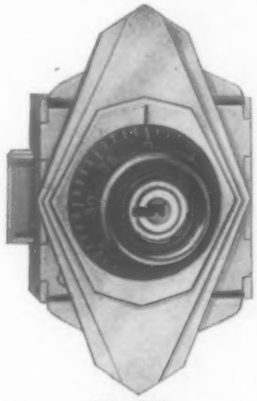
Chicago
Chattanooga
Cincinnati
Cleveland
Dallas
Detroit
Evansville
Grand Rapids
High Point, N. C.
Indianapolis
Jamestown
Kansas City, Mo.
Los Angeles
Martinsville, Va.
Milwaukee
New York
Portland
Rochester
St. Louis
St. Paul
San Francisco
York, Pa.
Toronto, Ont.

ROCKFORD COMBINATION LOCKER LOCKS are made for standard Steel, Wood or Masonite Lockers of any style or make. It is the complete line assuring the utmost in security, convenience, simplicity and durability. Rockford Locks have proven their worth in hundreds of Educational Institutions. For simplified and complete supervision and control select the Rockford Line.



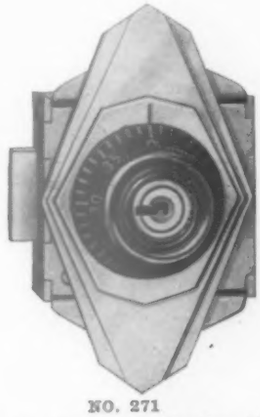
NO. 267

Master Keyed Combination Self Locking, for use on Lockers having spring latch bar. Over 64,000 different combinations available. No bolt or rivet heads visible from outside. Can also be furnished without Master Key feature.



NO. 269

For use on Box type Lockers having no latch bar. Lock has beveled spring bolt. Closing door locks lock and spins dial concealing last figure of combination. Furnished with or without Master Key feature.



NO. 271

Master Keyed Combination Dead Bolt Lock having square end dead bolt. Lock does not have self-locking feature. Combinations of this lock and Nos. 267 and 269 can easily be changed by removing escutcheon plate and turning dial.

COMBINATION SHACKLE LOCKS



NO. 265

Keyless Combination Self-locking Shackle Lock that is fool proof, secure and durable. Inserting shackle upsets combination by turning dial. Must be completely re-dialed to open. Over 64,000 different combinations available. This is a very popular lock in the Rockford Line. Lock case is Chromium Plated and dial is black with white figures.

Master Keyed for ease and convenience of supervision. Can be Master Keyed with all built-in Locks shown above, or Laboratory Lock shown below. Students operate lock by combinations, while officials gain access by use of Master Key. Dial is locked against rotation when shackle is open.



NO. 264

NO. 275

COMBINATION SHACKLE LOCK

Where Locks are purchased by School authorities to be sold on a no-refund basis, this Lock is suggested. The finish is Baked Aluminum and Varnish, a very attractive item, and all mechanical parts of any importance are made of Brass. Parts requiring extra strength are made of Steel, Cadmium Plated and are completely rust-proof. The shackle is self-locking and there are over 64,000 combinations available. Dialing is ratchet or click type permitting rapid operation and the large numerals are easily read, even in dark corridors or locker rooms. This is a full-size Lock of special value and should be re-sold to the students at 10¢ to 25¢ more than the actual School cost.

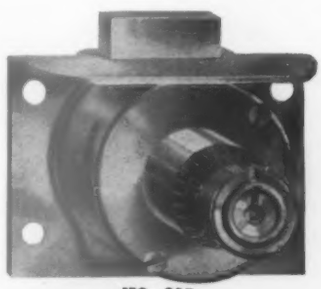


NO. 275

NO. 259

COMBINATION DRAWER LOCK

Combination Master Keyed Laboratory Drawer or Door Lock. Combination can quickly be changed without removing lock from mortise. Lock is of Solid Brass construction and is not affected by ordinary Laboratory fumes and acids. Lock is reversible for use on right or left hand doors.



NO. 259

Illustrated here are only a few of the many School Locks available in the Rockford Line. Ask for illustrated folder showing complete line.

THE YALE & TOWNE MFG. CO.

TRADE YALE MARK Stamford, Conn. TRADE YALE MARK

INTRODUCE true economies, maximum security and increased efficiency in locker rooms with these Yale Combination Locker Locks. They supply a degree of protection heretofore unavailable in locks of this type for locker use; security which discourages temptation, aiding in character development. Large easily read dials simplify operation, and minimize congestion and delay in locker rooms.

FOR ALL MAKES AND ALL TYPES OF STEEL LOCKERS

FOR NEW LOCKERS AND FOR REPLACEMENT OF WORN OUT LOCKS ON OLD EQUIPMENT

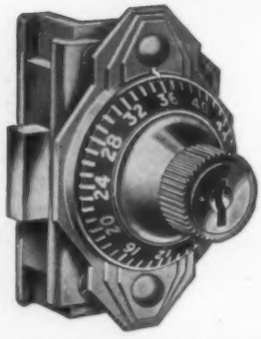
Exclusive Yale Features:

Maximum Security: Combinations dialed on three positive numbers. Combination must be known and cannot be located by manipulating dial.

Combination Disperser automatically upsets combination as lock is locked. A double safeguard. Acts as a defense against tampering.

Combination Changeable with every change of locker occupant—without removing lock from door. Feature secluded in back of lock in same secure manner as in Yale Bank Locks.

Supervisory Control of a group of lockers or the collective groups of a city school system obtained by the **Yale Emergency Key Control.** The key used is assigned exclusively to these locks.



For Lockers with Automatic Bolt Release Mechanism. Automatic Self-Locking Vertical Sliding Bolt. A New Locking Principle.

Emergency Key Controlled

No. L3374-CM, Cadmium finish
No. L3374-DZ, Chromium finish

Dial Operated Only

No. L3364-CM, Cadmium finish
No. L3364-DZ, Chromium finish



For Steel Compartment and Box Type Lockers. Beveled Spring-bolt, Automatic Self-Locking.

Dial Operated Only

No. L3369-CM, Cadmium finish
No. L3369-DZ, Chromium finish

Emergency Key Controlled

No. L3379-CM, Cadmium finish
No. L3379-DZ, Chromium finish



For Lockers with Gravity Type Locking Device. Dead Bolt Manually Operated.

Dial Operated Only

No. L3368-CM, Cadmium finish
No. L3368-DZ, Chromium finish

Emergency Key Controlled

No. L3378-CM, Cadmium finish
No. L3378-DZ, Chromium finish

NEW YALE COMBINATION PADLOCKS

FOR BASKET LOCKERS AND ALL OTHER TYPES AND MAKES OF STEEL LOCKERS

The finest and most secure combination padlocks yet produced

Same features of maximum security and automatic combination disperser as the above built-in type.

No. 579 Lock, Dial operation only.

No. 589 Lock, Dial operation with emergency key, provides supervisory control of lockers. May also be used with any of above built-in types under same control key.

These padlocks have ¼" diameter steel shackles and the graduations and numerals on the black enameled dial are easily read.

No. 375 Lock, Dial operation only. A good secure medium priced padlock. The steel shackle is $\frac{9}{32}$" in diameter and the case of solid rustless metal is attractively finished in bright baked aluminum.

The Yale Rotating Dial provides fast accurate dialing.

The Combinations are unlimited on all above padlocks.



No. 589 Master-Key Controlled Dial



No. 375 Dial Operated Only

P. O. MOORE, INC.

300 Fourth Avenue
New York 10, N. Y.

KEY-*FINDING*

KEY-*Filing*



VISIBLE KEY CONTROL SYSTEM

1 TELKEE is a tried and proven Visible Key-*Filing*—Key-*FINDING* System.

2 Whether there are a few keys or thousands of keys—TELKEE is simple and effective.

3 It is the perfect system for knowing your keys—knowing where they are when you want to use them.

4 TELKEE retains a Reserve-Pattern key—never loaned. Tells you to whom other keys have been loaned.

5 Your keys are identified only by the special TELKEE Cross Index—Positive Control.

6 New instruction booklet based on 14 years' experience makes TELKEE easy to set up and operate.

THE MICHAELS ART BRONZE CO., INC.

Second and Court, Covington, Ky.

PRODUCTS

Bronze Tablets and Signs · Bronze Doors and Casement Windows · Name Plates · Office and Lighting Fixtures · Bulletin Boards · Building Directories · Railings · Desk Sets · Lamp Standards Grilles and Wickets · Radiator Grilles · Kick and



PRODUCTS

Push Plates · Push Bars · Time-Tight Exhibit Cases · MI-CO Parking Meters · Cast and Extruded Thresholds · Wire Work (Partitions, etc.) · Marquise, and many other ferrous and non-ferrous metal products.

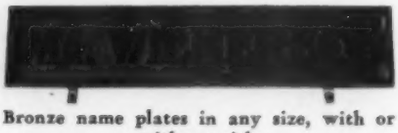
Michaels Bronze Tablets and Signs are manufactured in a wide variety of designs, shapes and sizes to meet all school and college requirements. A few are illustrated below. Bronze, virtually indestructible, is the ideal metal for permanent memorials. It lends itself readily to the hands of skilled craftsmen and becomes more beautiful as time goes by. Many designs may be furnished from standard patterns or modeled to your specifications. We shall gladly submit sketches and quote prices. When necessary, additional blueprints will be furnished for approval. Just tell us the space, the purpose of the tablet, and the wording to be used. Fully illustrated folder will be sent on request.



Bronze Tablets commemorate the construction of buildings or perpetuate the memory of public servants and benefactors who dedicated their lives to the service of mankind. Many designs, plain and ornate, in sizes to meet your requirements, are available.



Laurel design with contoured top. Bears intaglio portrait. Tablet size 20″ x 25″



Bronze name plates in any size, with or without title



Perpetuate forever, in everlasting bronze, the names of all who served, and the memory of those who sacrificed their lives that our nation might remain free. Illustrated above is one of the many standard honor rolls produced by Michaels. If desired, bronze memorial plaques will be designed to meet your requirements.

Michaels *Time-Tight* Exhibit Cases with Innerlocking Frames





Above: **Type 120**

Left: **Type 130**

Michaels Table Cases, Wall Cases, Aisle Cases, Suspended Cases, Recessed Cases, or Special Cases are manufactured with either extruded bronze or aluminum frames, and all have Michaels' exclusive innerlocking feature. Satin finish is standard, but if desired, electroplated or polished finishes may be supplied. Frames take full ¼″ polished plate glass. Shelves of glass, ¼″ or ½″, depending on weight requirements, have all four edges polished. Shelf supports are adjustable every inch. Paracentric locks are standard in all locked cases. No screws are exposed on the face of frames except where necessary for removable or hinged panels. If illumination is necessary, it will be the latest and best type. Illustrated folder giving complete specifications will be sent on request.

MAINTENANCE PRODUCTS AND BUSES

Floor Machines
Floor Treatments
Janitors' Supplies
Blackboard Resurfacing
Vacuum Cleaners
Plumbing Maintenance Tools
Grounds Maintenance
Lawn Mowers
Fence
School Buses



ADVANCE MACHINE COMPANY

2605 Fourth Street S. E., Minneapolis 14, Minnesota

One Machine SCRUBS — STEEL WOOLS — WAXES or POLISHES All Types of Floors

For rapid, profitable maintenance work on all kinds of floors—investigate what Advance has to offer you. For quiet, vibrationless operation—you'll find them unexcelled. The "Lowboy" design saves time and work and makes it easy to clean well in all the corners and under equipment. Hundreds of schools have for years profited by Advance dependability. (Names on request.)



ADVANCE "Lowboy" is built low enough to get under desks easily

ADVANCE "Lowboy"

Its speed, quietness, thoroughness and long life make it the ideal machine for school use



LOWBOY 12—¼ H.P. Motor. Brush spread 12"—brush speed 320 R.P.M. Single brush, 3 segments. Height over brushes, 5¾". Silent V-Belt drive. ADVANCE patented brush holder makes brush changing quick and easy. Both scrubbing and polishing brushes included. Also 12 H. with ⅓ H.P. 2½ gal. automatic dispensing tank extra.

LOWBOY 15—⅓ H.P. Motor. Brush spread 15"—brush speed 320 R.P.M. Single brush, 4 segments. Height over brushes, 5¾". Also 15 H. with ½ H.P.

LOWBOY 16—⅓ H.P. Heavy Duty Ball Bearing Motor. Brush spread 16"—brush speed 375 R.P.M. Twin brushes, 3 segments each. Height over brushes, 6¼". Opposite rotation assures perfect balance—no side pull. Spiral worm gear drive. Same equipment as above. A splendid machine for all general utility use.

LOWBOY 21—½ H.P. Heavy Duty Ball Bearing Motor. Brush spread 21"—brush speed 275 R.P.M. Height over brushes, 7¼". Same design and equipment as Lowboy 16. LOWBOY 21 is recommended for large areas and heavy duty service. Built to outlast and outperform any other machine.



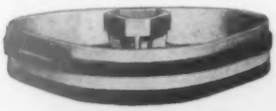
BRUSHES EASILY CHANGED

With the ADVANCE patented brush holder it takes but a moment to insert the brushes needed for the work at hand.



A BRUSH FOR EVERY PURPOSE

Brushes may be obtained in bassine, palmetto, tampico, steel wire, etc., for scrubbing, waxing, polishing, scouring, etc.



STEEL WOOLING

For steel wooling, burnishing or light sanding, suitable attachments can be furnished.

ADVANCE "Lowboy" ELECTRIC FLOOR MACHINES

HILD FLOOR MACHINE CO.

ESTABLISHED 1927

1313 W. Randolph St., Chicago 7, Ill.

Manufacturers of Floor Machines and Portable Vacuums . . . used for maintaining floors of all kinds and for many dust-control jobs



Plain-Handle Floor Machine
Used with easily interchangeable attachments to scrub, wax, polish, buff, sand, grind or steel-wool floors of all kinds . . . as pictured at bottom of this page.



HILD FLOOR MACHINES

Electrically Operated

The HILD Floor Machine is 100% efficient because the entire weight is on the brush. However, being self-propelling, this machine operates so easily that even a woman can run it for long periods without tiring. It operates continuously, in and out of corners, around columns, goes right up to the baseboard and under the edges of desks.

Only highest quality materials and workmanship are used in the manufacture of all HILD Machines. On Model "C" and "D" Machines, a 40-degree continuous duty Vertical Capacitor Gear Motor is employed. This motor has no brushes or commutator to wear out. The multiple transfer gears which transmit power from motor to bush divide the load, thereby reducing individual tooth stress, vibration, gear noise and power loss. These motors are completely mounted in rubber for silent, vibrationless "cushioned power." All models are equipped with rubber bumpers and the HILD Safety Switch which automatically shuts off power when operator's hands are removed from the handle.

SPECIFICATIONS: ***Four Popular Single Brush Models***

Plain-handle Floor Machine		***Junior***	**Model "A"**	**Model "C"**	**Model "D"**
Motor:	(Continuous duty) Manufacturer	G.E.	G.E.	G.E.	G.E.
	Horse Power	¼	1/3	½	¾
	Temperature Rise	40°	40°	40°	40°
	R.P.M.	1725	1725	1725	1725
Cable:	Length	40 ft.	40 ft.	40 ft.	50 ft.
	Gauge of wire	16	16	14	12
Brush:	Diameter of spread	11 in.	14 in.	16 in.	19 in.
	Diameter of Brush Block	9½ in.	12¼ in.	14 in.	17¼ in.
	Speed (R.P.M.)	180	180	172	172
Height:	Floor to top of motor	11½ in.	12 in.	14½ in.	15 in.
Weight:	Complete with brush and cable, aluminum base	55 lbs.	65 lbs.	100 lbs.	132 lbs.
	With cast iron base	62 lbs.	74 lbs.	118 lbs.	152 lbs.
Additional Specifications for "Shower-feed" Machines —					
Tank Capacity		3 gal.	3 gal.	3 gal.	3 gal.
Weight:	Complete with brush, tank and cable, aluminum base	71 lbs.	79 lbs.	110 lbs.	142 lbs.

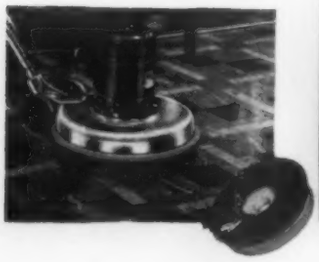


Portable Tank Type Floor Machine
Used with the Hild Shower-feed refillable Brush, pictured below, to scrub floors or to shampoo rugs and carpets without removing them from the floor. Also waxes, polishes, buffs, sands, grinds and steel-wools floors.

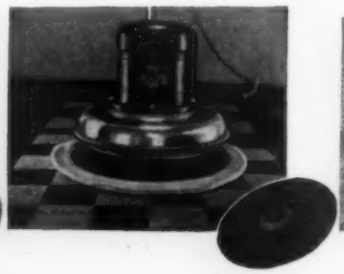
HILD Shower-feed Brush

This patented brush is used on the Hild Portable Tank Type Floor Machine to scrub floors (as pictured on the opposite page) and to shampoo rugs and carpets. The diagram shows how it works. Scrub-soap solution is fed from the storage tank to the back of the brush and is scientifically distributed to the channels running around the hub. In the bottoms of these channels are accurately spaced holes, penetrating the brush-back *between each row of bristles*. Soap solution passes through these holes and is evenly and economically distributed under the entire brush area. Brush is refillable.

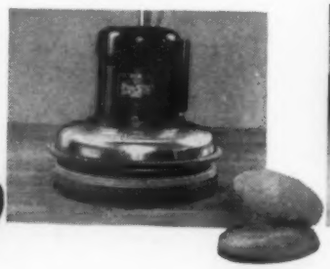
FLOORS OF ALL KINDS waxed · polished · buffed · ground · steel-wooled · sanded



WAXING AND POLISHING floors to a hard, lustrous finish with polishing brush on HILD Floor Machine.



BUFFING with lambs' wool or felt buffer on HILD Floor Machine. Removes streaks, goes under radiators, polishes waxed cove baseboards.



STEEL-WOOLING with pad and holder on HILD Floor Machine. Used for dry cleaning, polishing, scrubbing, wet buffing of penetrating seals, etc.



SANDING disc on HILD Floor Machine sands wood or cork tile. A 3-inch flat counter-sunk plate holds sandpaper firmly to rubber padded metal disc.

HILD "All-Purpose" Portable VACUUM MACHINE



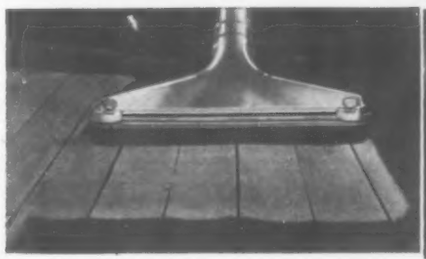
Here is a truly "all-purpose" vacuum . . . used without adjustment or change of parts to pick up either dry dust or liquid waste. With a series of easily interchangeable attachments, this machine can be used to simplify dozens of dust-control or dirt pick-up jobs, like those pictured on this page.

The machine rolls easily on four 3-inch casters. The dust arrestor tank is 22 inches high and 15 inches in diameter with ample capacity for recovered dirt. The machine is furnished with a ½ H.P. Black & Decker 8000 R.P.M. universal motor to operate on 115 volt D.C. or 25-30-50-60 cycle A.C. inclusive. Standard equipment includes the hose, handle and floor tool shown above and also a 5-inch utility tool.

Send today for

FREE BOOK

24 pages of data on floor maintenance and useful tips on dust control.



SWEEPING FLOORS

with brush attachment on HILD Vacuum. No cloud of dust, no sweeping compound needed. Removes dirt from cracks as well as from the surface.



CLEANING PIPES

with special attachment on extension handle of the HILD Vacuum. No ladders needed, no dust showered down onto floor below.



CLEANING SHELVES

with brush and utility tool on HILD Vacuum. Actually removes dust instead of pushing it from place to place or brushing it into the air.



CLEANING MOTORS

with blower attachment on HILD Vacuum. Machine can be used either as blower or vacuum to clean machinery, elevator shafts, air ducts, etc.



CLEANING WALLS

with brush and floor tools on HILD Vacuum. Used on walls of brick, concrete, etc., to prepare for painting . . . saves cost of washing.



DRYING FLOODED AREAS

with HILD Vacuum often prevents damage from heavy rains, a broken pipe, a clogged toilet, an over-flowing bath-tub, etc.

FLOORS . . Shower-feed Scrubbed and Vacuum Dried

With HILD Equipment, floors of all kinds can be scrubbed cleaner, faster, more economically . . . and left dry and slip-safe. Applying the scrub-soap solution through the Shower-feed Brush on the HILD Floor Machine assures thorough scrubbing, saves waste, and prevents splashing walls or furniture. Vacuum-drying with a special squeegee attachment on the HILD Vacuum completely eliminates rinsing and mopping. Floors come up cleaner without streaks or squeegee marks. Since the floor is dried almost instantly, there is no danger of slipping due to wet floors.



THE HILLYARD COMPANY

BRANCHES IN PRINCIPAL CITIES — 370 Turk St. San Francisco 2, Calif. — St. Joseph 1, Missouri, U. S. A. — 1947 Broadway New York 23, N. Y. — DISTRIBUTORS FOR HILLYARD CHEMICAL CO.

Approved Treatments and Maintenance for All Types of Floors and Floor Coverings

OVER 38 YEARS' SERVICE TO SCHOOLS AND UNIVERSITIES

FOR THE CLASSROOM

For Wood Floors, Hillyard's Penetrating Seal No. 21 permanently seals the wood against stains, absorption of dirt and moisture, presenting a surface extremely resistant to traffic. Classroom floors sealed with No. 21 Seal buffed with Neutone and cleaned with the Hillyard Steeltonian are tough and traffic resistant.

Hil-Brite Liquid Wax, a self-polishing type wax that is waterproof, wear resistant, and presents an attractive sheen.

For Blackboards, Hillyard's Blackboard Cleaner restores the blackboard to its original blackness eliminating eye strain.

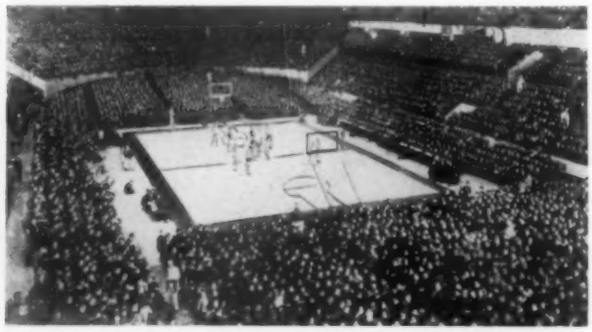
For the School Desk, Hillyard's Var, a light rubbing varnish applied with cheesecloth renews the old finish.

For the Cleaning, of painted walls, woodwork, desk, furniture, Hillyard's Super Shine-All—a neutral chemical cleaner that is safe for all surfaces, is not a soap, does not require rinsing.

For the Walls, Hil-Wal, a synthetic paint producing a beaded surface, available in eight school colors. Can be applied over any surface without washing, sizing, or priming the old wall. One coat is sufficient.

FOR THE GYMNASIUM FLOOR

For Finishing, one coat of Hillyard's Wood Primer, two coats of Hillyard's Super Gym Finish is the treatment used



Super Gym Finish, Eleven Years on Madison Square Garden Floor

on over 11,000 school gymnasiums to present a clean, inviting, attractive gymnasium that is easy and economical to maintain, guaranteed non-rubber burn, non-skid and to give the proper reflection of light.



Tray Foot Bath

For Maintenance of Gym Floor, Hillyard's Automatic treated with Hil-Tone Floor Dressing eliminates 50% of your labor cost on the maintenance of the gym. The entire gymnasium floor can be swept, cleaned and treated in the same operation in a very few minutes. Hil-Tone removes and prevents the formation of rubber marks.

For Gymnasium Walls, Hil-Wal Finish gives an easy-to-apply long-wear gymnasium wall. Can be applied over brick, plaster, cinder block with ease. One coat preparation covers dirt, marks, scratches, fills small cracks.

FOR THE SHOWER AND LOCKER ROOMS

Hillyard's Hi-Ko and Hard Rubber Footbath Trays, a must as an aid to the prevention of Athlete's Foot.

Hillyard's Cocoanut Liquid Hand Soap for the student showers.

Shower room walls, to eliminate soap and body grease scum, treat with Hillyard's Onex Seal.

FOR CORRIDORS

For Cement, Terrazzo, Magnesium Oxychloride and Similar Flooring Material, use Hillyard's Onex Seal, a formulated approved compound for permanently sealing and polishing.

For Wood Corridors, Hillyard's Penetrating Seal No. 21 and Super Hil-Brite Liquid Wax.

For Asphalt, Linoleum and Composition, Hillyard's Super Shine-All for cleaning, Super Hil-Brite for treating and maintaining.

For Maintenance, the use of the Hil-Tone treated Automatic makes cleaning and treating a simple operation, cutting hours off the labor overhead in the maintenance of school corridors.

For Occasional Scrubbing When Required, use Hillyard's Super Shine-All solution consisting of one part of Super Shine-All to seven parts of water, spread on the floor surface, when possible agitate with electric-driven scrubbing equipment such as the Hiltonian, remove with Hillyard Circular Squeegee and Hillyard Pick-Up Pans. It is not necessary to rinse after cleaning with Super Shine-All.

FOR THE LAVATORIES

The use of Hillyard's Onex Seal permanently seals cement and terrazzo against the absorption of moisture, makes cleaning and disinfecting of the lavatory floors easy and economical.

A Thorough Cleaning when required with Hillyard's Super Shine-All will keep the floors clean.

As a General Disinfectant for the Lavatory floors, use Hillyard's H-101, a combination cleaner and disinfectant. The powerful wetting agents of H-101 insure that all cracks and crevices are disinfected making sure aid against disease and epidemics.



Steeltonian 10 Inch—20 Inch



22 Inch—19 Inch—16 Inch

For the Hand Bowls, Hillyard's Porcelain Cleaner will keep them sparkling white, and **for the Urinals and Stools,** to keep them sparkling white, use Hillyard's Bowl Cleaner.

For Stubborn Rust Stains, a treatment with Hillyard's Formula No. 777 will restore vitreous china, porcelain, ceramic tile to their original colors.

To Keep Down Obnoxious Odors, use Hillyard's Blox-Odor Blocks, a highly volatile compound that completely deodorizes.

Hillyard's Pine-O-Cide, a triple, distilled, white pine oil with a coefficient of five plus, will destroy bacteria, germs, etc., and keep the lavatories clean and inviting.

Hillyard's Cocoanut Liquid Hand Soap, is a soothing soap that will not irritate the tenderest of skins. Made from cocoanut oils, non-alkaline and non-caustic.

Hillyard's Zizo, goes zizzling through stopped up drains and pipes.

FOR THE BOILER ROOM

Hillyard's Boiler Compound, when used according to directions will prevent the formation of scale in the boiler pipes and tubes. Wherever Aluminum Paint is required in the boiler room, request Hillyard's Aluminum Paint. It's tough!

FOR GENERAL BUILDING MAINTENANCE

Hillyard's Roof Coating Will stop the most stubborn of leaks and add years of life to the roofs.

Hillyard's Caulking Compound used to seal cracks around casings, doors, crevices and cracks in brick walls. Hillyard's Caulking Compound will not set hard, become brittle and crack away.

Hillyard's Windo-Clean makes window cleaning easy. Hillyard's Windo-Clean eliminates the necessity of buckets, chamois, sponges, and squeegees. Spray Windo-Clean on the glass, wipe dry.

Hil-Wal Finish, a plaster paint to restore cracked walls.

For the Cleaning, Waxing, Steel Wooling of large areas, we suggest the use of the Hillyard line of floor maintenance machines—the Steeltonian for steel wooling.

For Scrubbing or Waxing, the Hiltonian combination Scrubbing and Polishing Machine obtainable in three sizes—16, 19, and 22 inch.

Hillyard's are the sole distributors of the American Steel Wool products to the School Field. The Braid-O-Pad is obtainable in 8 inches up to and including 20 inches and in No. 0, 1, 2, and 3 grades.

For outside walls that will absorb moisture, we suggest Hillyard's Colorless Outside Waterproofing Compound.



SUPER HIL-BRITE

Super Hil-Brite Liquid Wax is the one wax that does not contain shellacs, varnish, rosins or any ingredients to harm or discolor any of the surfaces to which it is applied. It can be used on all types of flooring, whether wood, asphalt, rubber composition, linoleum, etc.

HIL-TONE



Hil-Tone for the all around product for the daily maintenance of your classroom, gymnasium floors, for your dust cloths, in the cleaning and dusting of furniture, desks, woodwork. The Hil-Tone treated Automatic makes the sweeping and maintenance of your school floors easy and economical.

SUPER SHINE-ALL

Super Shine-All is safe for all types of floors and other surfaces. Super Shine-All is a neutral, chemical cleaner. It is the one cleaner that can be used for every and any cleaning purpose—for floors, for desks, for painted surfaces, for composition floors, walls, Super Shine-All is the one cleaner that provides 100% active cleaning units for any and all jobs.

FOR THE SCHOOL CAFETERIAS AND LUNCHROOMS

Hillyard's Hi-Ko used in the rinse water helps in the prevention of the spread of colds, flu and contagious diseases.

The lunchroom tables can be kept clean and white by painting them with Hillyard's Colortone, a phenolic resin type finish containing a pigment. It may be obtained in other colors besides white. Or if natural color is desired, Hillyard's Super Gym Finish will give a surface that can be washed many, many times with Hillyard's Super Shine-All without any damage to the finish.

The floors can be kept clean by sweeping daily with Hillyard Automatic treated with Hil-Tone. For wood floors we suggest the use of Neutone and the Hillyard Steeltonian Steel Wooling Machine.

The cafeteria walls can be made pleasing with any one of the eight pastel shades of Hil-Wal Plaster Paint.

Roaches and Other Pestilences that are found around the lunchrooms can be kept under control through the use of Hillyard's insecti-anni Roach Powder and Hilco Insecticide.

Outside Installations of Playground Equipment, can be preserved and protected with Hillyard's Aluminum Paint.

HILLYARDS MAINTAIN BRANCH OFFICES, WAREHOUSES AND TRAINED ENGINEERS IN EVERY LOCALITY. A CARD ADDRESSED TO HILLYARDS, ST. JOSEPH, MISSOURI, WILL BRING THE FREE SERVICE OF THE HILLYARD FLOORING AND MAINTENANCE ENGINEER TO YOU. YOU ARE UNDER NO COST OR OBLIGATION IN REQUESTING HIS SERVICE

FREE ON REQUEST ANY OF THESE SIX VALUABLE HELPS



HUNTINGTON LABORATORIES, INC.

DENVER — 45 University Ave., Huntington, Indiana — TORONTO

MANUFACTURERS OF SANITATION AND MAINTENANCE PRODUCTS FOR EVERY DEPARTMENT OF THE SCHOOL AND UNIVERSITY

● **FOR CLASSROOMS, CORRIDORS, AND OFFICES**

Floor Seals and Finishes, Floor Waxes, Scrub Compounds and cleansers for every type of flooring, Furniture and Desk Polishes, Blackboard Cleaners.

● **FOR WASHROOMS AND TOILETS**

Liquid Toilet Soaps, Porcelain Cleansers, Metal Polishes, Deodorant Blocs, Drain Openers, Toilet Bowl Cleansers, Deodorants and Disinfectants.



A COMPLETE CATALOGUE —YOURS FOR THE ASKING!

● **FOR GYMNASIUMS, POOLS, AND SHOWER ROOMS**

Seal-O-San, the Famous 100% Non-slippery Floor Seal and Finish, Odorless Derma-San, Liquid and Powder for Athlete's Foot Prevention, Tile and Marble Cleaners, Rubber Burn Mark Eradicator.

● **FOR LUNCHROOMS AND KITCHENS**

Huntington Laboratories manufacture a complete line of Dishwashing Crystals and Water Softeners, Insecticides, Metal and Porcelain Cleansers for use in lunchrooms and kitchens.

TWO FLOOR MAINTENANCE PRODUCTS DESIGNED TO SAVE TIME AND LABOR IN YOUR SCHOOL

FLOOR-SAN — LIQUID SCRUB COMPOUND

At last, floor cleaning has been reduced to its simplest terms —a single cleanser for every floor in your building! Away with special cleansers safe to use on only one type of floor! Away with janitors' wasted minutes and the complicated job of buying numerous cleaning products! Away with the fear of ruining fine flooring! When Floor-San takes over, floor cleaning problems vanish, for Floor-San promises thorough cleaning—with guaranteed safety—no matter where it is used!

Safe on All Types of Floors

You can use Floor-San with absolute safety on rubber tile, asphalt tile, linoleum, terrazzo, wood, or any other flooring. What's more you also get thorough cleansing, for Floor-San has powerful detergent properties which quickly rout dirt.

Floor-San a Time Saver

By using Floor-San for all floors, you save time for yourself and your janitor. You need buy only one product—Floor-San —and your buying job is done. The janitor saves time too because he can clean without the need for preparing special cleansers.

Flooring Manufacturers Approve It

Floor-San Scrub Compound has received the approval of the Rubber Flooring Manufacturers Association. It is also endorsed by asphalt tile manufacturers. Such approval means that Floor-San is mild . . . won't discolor . . . won't run colors.



Let Our Experts Help You

If you have a flooring problem that demands attention, write to Huntington Laboratories. Our trained flooring experts will promptly furnish you with practical information. If you desire, an experienced representative will call on you without any obligation on your part.

NEO-SHINE — CONCENTRATED SELF-SHINING WAX

Neo-Shine has a wax content 50% higher than the average self-shining wax. In addition, it is correctly made. That is why it is one of the most sought for waxes on the market today. One application alone lays a protective, thin wax film sufficient to withstand the hardest wear—a film soft enough to prevent powdering or marring, yet hard enough to give a smooth, dirt-repelling, water-resisting surface that will not track. Neo-Shine is properly balanced so that it can be readily removed from the floor when necessary. It will not build up—will not discolor the floor.

Withstands Rainy Day Traffic

Neo-Shine is not only wear-resisting—it is also extremely high in its water repellent action due to a new emulsifying agent. Unlike ordinary, quick-drying waxes, Neo-Shine shows no white spots from the dripping of water. Neither does it wash completely off the surface when it is mopped. For this reason, Neo-Shine is especially useful for treating the lower floors or entrances of buildings where water and snow are tracked in by pedestrians.

Guaranteed Safe on Rubber and Asphalt Tile

Because Neo-Shine contains no naphtha, turpentine or similar solvents, it may be used with complete safety on rubber tile and asphalt tile floors. It is approved and endorsed for use on all makes of asphalt tile flooring such as Tile-Tex, U. S. Rubber Asphalt Tile, Johns-Manville, Hanotile, Dura-Flex, and all makes of rubber flooring.



Neo-Shine is strictly a water emulsion wax. It dries quickly with a real sheen, without polishing. That saves labor. Just apply it with a clean lambs-wool mop and your floor looks like new.

SEAL-O-SAN

NON-SLIPPERY SEAL & FINISH FOR GYMNASIUMS

FOR AN EASILY APPLIED, ECONOMICALLY MAINTAINED, NON-SLIP GYMNASIUM FLOOR FINISH

● Gymnasium Seal-O-San—the Famous 100% Non-Slippery Floor Seal and Finish—is made expressly for gymnasium floors. This free flowing compound fills and hardens the wood fibres at the surface of the floor and thus prevents grease, dirt, or rubber burns from piercing the surface. It produces a beautiful, long-wearing playing surface, 100% non-slippery. It has no equal for withstanding the punishing action of basketball and other gymnasium activities.

Gymnasium Seal-O-San has been tried, tested and approved by more than 5500 schools—large and small—all over the nation. In Indiana—the home of basketball—more than 90% of all gymnasium floors are finished with non-skid Seal-O-San.



Mopped-on Finish Means Lower Cost

Slip-Proof Seal-O-San Prevents Accidents and Infections

Skids and falls rarely happen on a Seal-O-San finished floor because the 100% non-slippery surface permits quick starts and sudden stops without undue strain on leg muscles. Thus, many accidents which occur on slippery gym floors are eliminated.

Also, by sealing the floor, Seal-O-San fills any cracks and crevices and provides a smooth surface with no hiding places for "athlete's foot" spores or other disease germs.

The Seal-O-San Finished Floor Simplifies Maintenance

Seal-O-San cuts maintenance costs as much as 50%. For Seal-O-San is more than a surface finish. As the liquid penetrates deep, it fills the wood cells, hardens and seals the surface with a protective armor. Nothing can penetrate this finish. Thus, dirt, moisture and rubber burns remain on the surface of the floor—easily removed with a dustless mop. Costly scrubbing is seldom needed.

Non-Slippery Seal-O-San Gives the Floor a Beautiful Finish

Free-flowing, Seal-O-San leaves a natural, soft-lustre finish—as smooth and polished as the finest desk. And in spite of its deep penetration, Seal-O-San will not darken the floor.

Since Seal-O-San prevents dirt from getting into the wood, cleaning the floor becomes a simple matter. All that is needed to keep the beautiful finish lustrous and attractive is an occasional cleaning with a heavy dustless mop.

PENETRATING SEAL-O-SAN

PERFECT SEAL AND FINISH FOR WOOD FLOORS

FOR CLASSROOM FLOORS, CORRIDORS, AUDITORIUMS AND AREAS SUBJECT TO HEAVY TRAFFIC

● Penetrating Seal-O-San, like Gymnasium Seal-O-San, is a specially prepared floor finish that is quickly and easily applied with a mop. It contains hard drying oils and waterproof resins which penetrate deep into the wood and reinforce surface fibres. Thus, a Seal-O-San finish actually becomes a part of the wood. That is why a Penetrating Seal-O-San finish lasts for years. Since it leaves no surface finish to chip, crack, or peel, Penetrating Seal-O-San is ideal for use on floors subject to extremely heavy traffic.

Ordinarily, two coats of Penetrating Seal-O-San will seal the floor and give it an attractive dull sheen resembling hand buffed furniture.

How Penetrating Seal-O-San Prevents Traffic Lanes

Ordinary floor finish rests on the surface and as the brittle finish wears away, traffic lanes result.

A Penetrating Seal-O-San finish becomes an integral part of the floor. As the liquid penetrates it fills empty wood cells, then hardens to form a protective seal against dirt, moisture or wear. Because this seal extends below the surface of a Seal-O-San floor, you never see traffic lanes.

Method of Application Assures Low Cost

Superintendents will assure themselves of lower refinishing costs by demanding Penetrating Seal-O-San. For Penetrating Seal-O-San is applied by mop or wide brush without the use of highly skilled labor. Thus, it offers tremendous savings in labor over costly hand brushed finishes.

Coverage is generous, approximately 250 sq. ft. to the gallon for a two-coat application.

Advantages Over the Ordinary Type of Surface Treatment

Penetrating Seal-O-San provides a rugged, durable finish that stands up under severest punishment. It provides the fastest and most economical method of treating wood floors. Unlike surface finishes, Penetrating Seal-O-San will not crack, chip, or peel. It preserves and enhances the natural beauty of the wood and cuts maintenance costs to a minimum.



THESE SCHOOLS AND 5500 MORE USE AND APPROVE GYMNASIUM SEAL-O-SAN

Seal-O-San finished floors can be inspected and tested in every state of the Union. If these schools are "out-of-bounds" write us and we will gladly give you a list of Seal-O-San finished floors in your own vicinity.

Yale University
University of Arizona
Mesa College
University of Montana
University of Mississippi
Louisiana State University
University of Chicago
Ball State Teachers College
Notre Dame University
Purdue University
Indiana State Teachers College
Colgate University
Ohio State University
Otterbein College
Rutgers University
Oberlin College
University of Minnesota
Goodyear Tire & Rubber Co.
Stephens College
Missouri Southeast Teachers College
University of Tennessee
University of West Virginia
North Carolina State College
Annapolis Naval Academy
Virginia Polytechnic Institute
New York University
Baylor University
University of Kentucky
Center College
Bates College
North Texas State College
Iowa State University
College of the Pacific
University of Michigan
State Teachers College, E. Stroudsburg, Pa.
Swarthmore College
Tufts College
Rhode Island College
Deerfield Academy
Williams College

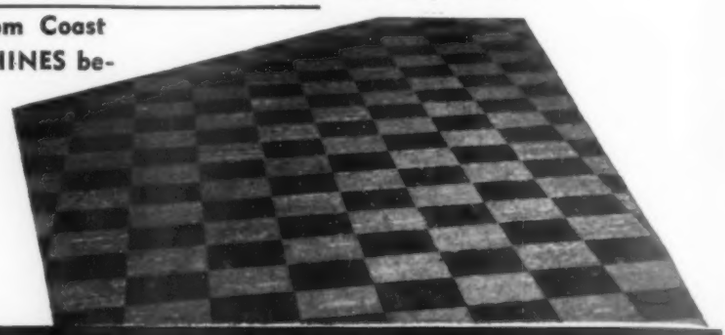


GENERAL FLOORCRAFT Inc.

(Department "A") — 333 Avenue of the Americas, New York 14, N. Y.

SCHOOLS, HOSPITALS, INSTITUTIONS from Coast to Coast employ "GENERAL" FLOOR MACHINES because they are —

Highly efficient—Quiet in operation—Trouble-free —Low in original cost—Economical to maintain. And also because "GENERAL" Machines insure longer life to wood, tile, terrazzo, linoleum, cork, mastic, concrete, rubber or any other type of floor.



IT'S EASY TO KEEP FLOORS CLEAN-

with the *Precision-Built*

"General" FLOOR MACHINE

"GENERAL" FLOOR MACHINES are engineered by a master floor-craftsman and they are built for long-lasting, smooth-running efficiency by an organization of skilled workmen.

"General" Floor Machines work quickly, easily, smoothly, thoroughly. They save time and money, assure cleanliness and promote sanitation, safety.

The "General" Waxes, Polishes, Scrubs, Sands, Steel-wools, Buffs, Dry-cleans, Restores all kinds of floors to their original beauty.



Because of its sturdy construction, with Heavy Duty All-Gear Drive, the "General" will maintain all kinds of floors in every possible manner, day in and day out. All our floor machines are built to take punishment.

The "General" K-18 shown here is recommended for Schools, Colleges, Hospitals and Institutions.

The GENERAL is made in 5 sizes: 13″ and 15″ brush diameter in the S series; 16″, 18″ and 22″ brush diameter in the K series.

The "GENERAL" is guaranteed for one year to perform as promised. A demonstration and Ten-Day Trial of the "GENERAL" will be arranged upon your request.

Write for catalog and name of nearest dealers or your own dealer for free demonstration on your own floors.



HOLT MANUFACTURING CO.

Newark, New Jersey — Oakland, California

Address all inquiries to HOLT MFG. CO., 651-681 20th St., Oakland, California

HOLT *Floor Machines* CUT UPKEEP COST



The Holt Underslung—a "natural" for school floor maintenance. Gets under furniture, eliminates handwork. Will clean, polish more floor at less cost. Ten quickly changed Holt attachments adapt the Underslung for any job

THERE'S no place in your maintenance budget for floor machines that get "out of service." Repairs mean time and money lost . . . added overhead.

Holt Floor Machines are as dependable as your master clock. They are quality-built to give you years of trouble-free service under all kinds of operating conditions. At the same time, a Holt will cover more floor in *less* time, at *less* cost and do a *better* job than any other floor machine you can buy. That's why Holt Floor Machines have been favorites of school and university maintenance staffs for over twenty years. Compare the Holt line with any competitor. Write today for complete information — there's a Holt for every floor upkeep job.



Holt Double Vacuum All-Purpose Machine. This efficient lever controlled machine is designed to handle large floor areas in schools and other institutions. Using Holt attachments, it will sand, steel wool and polish. A most popular machine with school maintenance men throughout the country



Holt Silent President. A rugged versatile polisher, precision-built, yet tough and strong and able to "take it" with minimum time out for repairs. Silent in operation, no noisy, grease-dripping chains or sprockets. Ten Holt attachments for sanding, polishing, wire brushing, steel wooling, waxing, burnishing

THE KENT COMPANY, INC.

174 Canal Street, Rome, N. Y.

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AND MANY OTHER PRINCIPAL CITIES

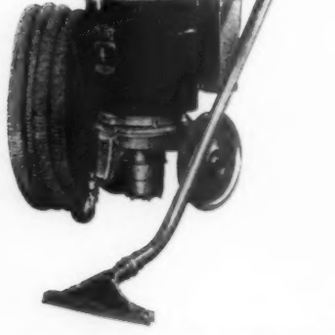
KENT

FLOOR MACHINES
VACUUM CLEANERS
ELECTRIC MOPPERS



This is a* QUIET KENT ELECTRIC FLOOR MACHINE—*for scrubbing

It also performs with ease, speed and efficiency the tasks of polishing, buffing, sanding and steel-wooling.



This is a* KENT ELECTRIC DRY SUCTION—*for vacuum-cleaning

Powerful Suction, easily portable, plus a great variety of uses are noteworthy advantages of this KENT machine.



This is a KENT ELECTRIC MOPPER—*for water pick-up*

It dries floors quicker, cleaner, and sucks water up out of the cracks. Hand labor and old-fashioned methods cannot compare with the speed, efficiency and economy of this modern electrical tool.

10 MODELS AND SIZES TO CHOOSE FROM

★ ★

MODERN FLOOR CARE IN SCHOOLS REQUIRES MECHANICAL EQUIPMENT

★ ★



KENT SUCTION VACUUM CLEANER—*assures dustless cleaning of classrooms*

★ ★

A HIGH STANDARD OF SANITATION CAN BE MAINTAINED BY USING KENT EQUIPMENT

★ ★

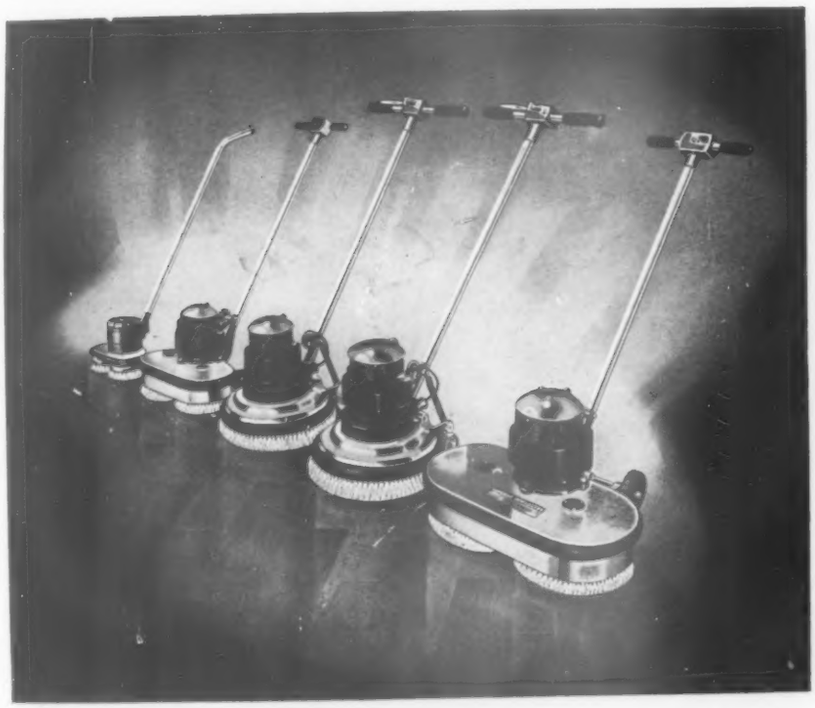
LINCOLN-SCHLUETER FLOOR-MACHINERY COMPANY, INC.

540 S. Peoria Street, Chicago 7, Ill.

50 YEARS OF SERVICE

FOR HALF A CENTURY

Lincoln Products Have Faithfully Served Schools and Universities



The Lincoln Line of FLOOR SCRUBBING and POLISHING Equipment

No. 11. Small office or school model with two brushes covering a floor span of 11 inches. Like all Lincoln models pictured here, you can use it for scrubbing, waxing and polishing floors of wood, linoleum, tile, concrete, etc. Even a child can operate it!

No. 32. Especially designed for efficient, fast and economical scrubbing and polishing in medium-size schools and institutions. Interchangeable scrubbing and polishing brushes are available for all Lincoln polishing machines. The floor span of this machine is 16 inches.

No. 15. The Lincoln Single-Disc "Sphinx" Silent Polisher and Scrubber. Full weight of the motor directly over brush. Perfectly balanced for easy operation. Equipped with safety switch. Brush covers in excess of 15 inches floor span and works right up to baseboard.

No. 18. This heavy duty single-disc "Sphinx" Silent Polisher and Scrubber has a floor span of 18 inches and is ideal for large areas. Has an automatic safety switch, extra length guide handle and life-time lubrication. May be equipped with tank and automatic water feed if desired.

No. 21. Heavy Duty Twin-Disc Model . . . the world's fastest and most efficient polishing and scrubbing machine. Has 21 inch brush span. The twin brushes revolve in opposite directions eliminating all side pull or whip—thus, even with its size, this machine is guided without effort.



Gently shampoos rugs and carpets to new lustrous beauty

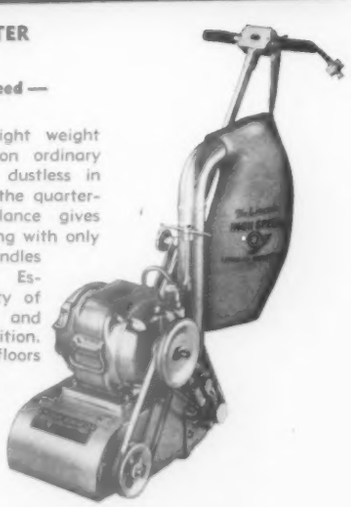
THE LINCOLN R.S. 15 RUG SCRUBBER

Cleans Rugs and Carpets right on the floor—safer—better—at LESS COST. Restores the original lustre and vivid color to your rugs and carpeting via the Lincoln on-the-floor shampoo method. Rugs or tacked-down carpeting are cleaned right on the floor—actually a complete rug cleaning plant in *one* machine that shampoos and cleans in a single operation. Driven by a powerful constant speed motor, a cushion of quick-acting lather quickly dissolves and releases all imbedded grease and soil accumulations. NO SOAKING — NO RINSING—NO SIZING. Clean rugs at night—use them the very next morning!

LINCOLN-SCHLUETER HIGH-SPEED 9

Fast Cutting — High Speed — Light Weight

Combines fast-cutting with light weight and high speed. Operates on ordinary lighting circuits. Completely dustless in operation. Sands right up to the quarter-round molding. Perfect balance gives operator direct control of cutting with only light pressure required at handles —remarkably easy to operate. Especially valuable for a variety of floors of different materials and of different age and condition. Sands old, warped, worn wood floors to reveal the hidden surface of smooth new wood. Comes equipped with full 1 H.P. motor.



SERVICE — Repairs and replacement parts available now

Representatives in All Principal Cities

LINCOLN-SCHLUETER FLOOR MACHINERY COMPANY, Inc.

540 SOUTH PEORIA STREET **CHICAGO 7, ILLINOIS**

World's Manufacturer of the Most Complete Line of Floor Maintenance Equipment

MIDLAND LABORATORIES

Dubuque, Iowa, U. S. A.

FOR • BETTER • FLOOR • MAINTENANCE

LOHSEAL · Penetrating Wood Floor Seal



Quickly and Easily Applied !

For the cellular reinforcement of wood floors. A deep-sealing, hard-drying phenolic resin seal with an exceptional resistance to wear. The ideal foundation for Midland EV-R-Glo Wax or Midland Gym Finish.

GYMLOH · Special Gymnasium Floor Finish

Less Slip Hazard ———— !

Midland GYMLOH is a tough finish; specifically designed for gymnasium floors. GYMLOH is easily applied, non-slippery, will not rubber burn, and is resistant to dilute acids and alcohol.



SOIL-*Solv* · All-Purpose Floor Cleaner



For **SAFE** *Use On All Floors!*

Midland SOIL-Solv combines the best qualities of liquid soap and synthetic cleaner to provide quicker cleansing, more complete and faster-rinsing. SOIL-Solv may be used with safety and economy on all types of floors, walls, and woodwork.

EV-*R*-Glo · Self-Polishing Liquid Wax

Water and Traffic Resistant !

Midland EV-R-Glo self-polishing liquid wax, easy to apply, quick to dry, water resistant and relatively non-slippery. . . . EVERYTHING YOU DEMAND IN A WAX! Midland EV-R-Glo not only protects floor finishes from heavy traffic but adds a lustrous beauty as well.



L. SONNEBORN SONS, INC.

Building Products Division

88 Lexington Avenue — New York 16, N. Y.

11 SONNEBORN *aids* TO BETTER SCHOOL MAINTENANCE

✓ LIGNOPHOL for Wood Floors, Trim

LIGNOPHOL is no ordinary surface finish, but a beautifying and preservative treatment that penetrates into the wood, depositing toughening resins and life-imparting oils which resist moisture, molds, fungi and wood-destroying organisms. Recommended for the preservation of floors and for beautifying trim and paneling. LIGNOPHOL assures substantial economies in time and labor, because only a single application is required to obtain its full benefits.

✓ LAPIDOLITH LIQUID for Concrete Floors

A patented colorless liquid which hardens, dustproofs and protects concrete floors for many years, by chemical action. The application of LAPIDOLITH LIQUID will not interfere with daily schedules since floors can be kept in use during and directly after application, if necessary. LAPIDOLITH LIQUID also hardens and wearproofs terrazzo floors.

✓ CEMCOAT Filler and Dustproofer

A tough, resilient compound of treated gums, varnishes and oils. Penetrates and dries with a hard but flexible film, providing a smooth, dustless and highly decorative finish for cement or concrete floors. Primarily for concrete, but can also be used on wood floors. Available in 8 colors, white, black, and transparent.

✓ FLOORLIFE CLEANER

A unique type of wood floor cleaner which renews the finish as it cleans. It is neutral and does not raise the grain, discolor or warp the wood as do alkaline or other harsh chemical solutions.

✓ SONOSHEEN Waxes

For maintaining floors of wood, rubber, linoleum, tile, asphalt, terrazzo, composition, varnished and painted floors; also woodwork and furniture. Available in self-polishing and buffing (liquid and paste) types.

✓ CEMCOAT for Walls and Ceilings

CEMCOAT is a carefully processed oil-base interior paint formulated from the most modern tested pigments and a specially treated vehicle. CEMCOAT fits perfectly into any balanced color program. It enjoys wide acceptance among school maintenance men and superintendents wherever better light reflection is desired and the ability to withstand frequent washings is necessary for economical maintenance. CEMCOAT is available in enamel gloss, flat and fume-resisting—in white and a variety of attractive and serviceable shades. It is easy to apply and gives long-lasting service.

✓ STORMTIGHT for Roofs

A protective compound for surfacing, patching and repairing roofs. Nationally known for outstanding quality. In Liquid and Plastic forms. For use on all types of roofs, including felt and composition, tin, corrugated iron, galvanized and other metal, tar and gravel or slag, concrete, shingle and canvas.

Anyone who can handle a paint brush can apply STORMTIGHT quickly and successfully. It is applied cold. Shipped ready for use—no thinning or heating required.

✓ CAULKING COMPOUNDS

SONNEBORN has been identified with the manufacture of airproof, waterproof and elastic caulking compounds for many years. SONNEBORN Caulking Compounds are used extensively on federal projects and meet U. S. Bureau of Standards tests. They function efficiently under a wide range of climatic conditions. Shipped in gun or knife grade, or in cartridges.

✓ HYDROCIDE Colorless for Exterior Masonry

Protects brick, concrete, masonry and stucco walls against the cumulative effects of rain, snow and sleet, without changing the texture and beauty of the surface to which it is applied. HYDROCIDE COLORLESS is free from wax and oil; therefore, it is unaffected by extreme heat or cold. Hundreds of applications to masonry of all types demonstrate its efficiency in all kinds of weather.

✓ S. R. P. for Protecting Metal Surfaces

For any iron, steel, or galvanized iron surfaces, etc. Suitable alike for interior and exterior use. Outstanding for its remarkable rust-inhibitive properties. Often eliminates necessity of scraping surfaces to bare metal before repainting—simply remove loose or scaling rust. S. R. P. Coating is unusually resistant to corrosive agents other than air or moisture; even acids, alkalies and salt water find an impenetrable barrier between the S. R. P. Coating and the metal which it protects.

✓ PAINTS, ENAMELS, VARNISHES

There is a SONNEBORN paint, varnish or enamel especially designed for protecting and decorating every inside and outside building surface. SONNEBORN exterior paints have been noted for decades for their appearance and weather-resistant qualities. Inside, SONNEBORN specialty paints find a wide range of applications on walls, ceilings, floors and equipment of all types.

Free TO SCHOOL EXECUTIVES

Write Dept. SU46 for Sonneborn's 16-page building maintenance manual—and call on Sonneborn for practical help in solving problems of school protection against moisture, weather or wear.

BUILDING PRODUCTS DIVISION

L. SONNEBORN SONS, Inc.

Dept. SU46, 88 Lexington Ave., New York 16, N. Y.

G. H. TENNANT COMPANY

Established 1870

General Offices and Factory: 2578 2nd Street No., Minneapolis 11, Minn.



Typical School Floor Maintained by the Tennant System

Tennant FLOOR MACHINES for Schools

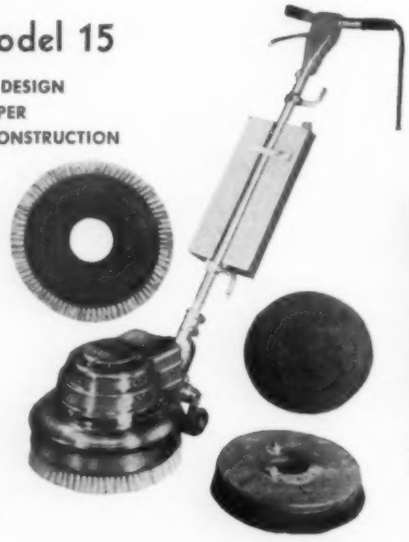
RUGGED, POWERFUL, EASY TO OPERATE Tennant Floor Machines have been first choice of leading schools and colleges for decades. Built for hard service and specially designed for use on *all* types of school floors, Tennant machines offer unsurpassed efficiency and economy in floor maintenance. Extremely versatile. Can be fitted with easy-mounting accessories to meet all maintenance requirements.

Tennant Model 15

- COMPLETELY NEW DESIGN
- QUIET AS A WHISPER
- EXTRA RUGGED CONSTRUCTION

IDEAL FOR
Asphalt Tile,
Rubber,
Linoleum
and other floors

Accessories for
SCRUBBING
STEEL WOOL BURNISHING
POLISHING



Tennant Model 15 with Accessories, Including Steel Wool, "Edge-Bristle" Brush, etc.

COMPLETELY NEW in design, construction and performance, the Tennant Model 15 will give *extra* years of smooth, quiet, trouble-free service. Has distinctive features possessed by no other machine of this type. Extra low, superbly balanced, easy to handle. **WRITE FOR COMPLETE DETAILS** about this popular new disc type machine.

FEATURES: Compact 1740 RPM MOTOR, axial air-gap type; grease-sealed, splash-proof, brushless. BRUSH SPEED 175 RPM; positive gear drive, no belts to slip. 15" ACCESSORIES, easy to mount; rubber bumper. WATER CONTAINER, 2 gal., positive valve release. AUTOMATIC WHEEL LIFT allows concentrated or divided-weight position. SEND FOR NEW BULLETIN.

Tennant Model C

THE IDEAL "ALL PURPOSE" MACHINE FOR EFFICIENT, LOW COST MAINTENANCE

- DRY CLEANS
- BURNISHES
- SANDS
- WAXES
- POLISHES
- SCRUBS
- SWEEPS



Use of 16" Brush or Steel Wool Roll with Easy-mounting Bar Wax Cartridge Permits Cleaning, Waxing and Polishing in ONE OPERATION



A rugged, highly adaptable machine that accommodates both 8" and 16" accessories. Keeps school floors clean without use of water or chemicals . . . works equally well for wet or dry cleaning . . . cleans, waxes (with hard bar wax) and polishes in one operation. Operates flush with wall; has two speeds; powerful vacuum pick up.

FEATURES: 1725 RPM MOTOR, high torque type, 1 h.p., for 110 or 220 v. single-phase AC, or 220/440 3-phase AC. RUGGED FRAME of cast and polished aluminum, well balanced for easy handling; end cover swings up for rapid mounting of accessories (no tools required). HEAVY DRUM ASSEMBLY, extra rugged, with Timken bearings; smooth running, quiet. 2-SPEED DRIVE allows drum speeds of 800 and 1400 RPM. VACUUM SYSTEM includes powerful 5000 RPM fan, large soilage bag.



Accessories include 8" and 16" Steel Wool Rolls, Steel Wire Brush, Polishing Brush, Sanding Drum, Scrubbing Brush

TENNANT FLOOR TREATING MATERIALS

NO. 67 FLOOR SEAL. Penetrates and binds top fibers to provide hard, smooth, wear resistant surface. Can be buffed wet.

NO. 101 FLOOR FINISH. An ideal semi-surface seal for any wood floor. Can be buffed.

NO. 23 SURFACE RENEWER. Cleans and restores sealed floors. Can be buffed wet.

TENNANT SPIRIT WAX. An excellent heavy duty non-slip wax finish. Can also be used as wood floor cleaner.

TENNANT WATER RESISTANT WAX. A long-wearing, economical wax for all types of floors. Self-polishing.

"The way to finer floors" TENNANT Floor Maintenance System

There's a Tennant Specialist in your vicinity who will gladly inspect your floors and recommend correct maintenance procedures.

WOOD FLOORS? THEN USE THE TENNANT SYSTEM!

The Tennant System is a time-tested, scientific method of floor maintenance that prolongs floor life, increases light reflection and wear resistance, keeps floors sanitary and CUTS MAINTENANCE COSTS as much as 50%.

1. **PROVIDES NEW LIVE FLOOR SURFACE** by smooth, fast removal of dingy, frayed, topwood fibers.
2. **HARDENS FLOORS TO RESIST DIRT, WEAR.** Provides smooth, hard surface to withstand heavy traffic.
3. **KEEPS FLOORS BRIGHT, SPOTLESS** without scrubbing. Makes maintenance an easy one-man operation.

WRITE FOR SYSTEM BULLETIN 81.B

CONTINENTAL CAR-NA-VAR CORPORATION

1637 EAST NATIONAL AVE.

BRAZIL, INDIANA, U. S. A.



THE WORLD'S LARGEST MANUFACTURERS

SPECIALIZING IN FLOOR TREATMENTS FOR LARGE FLOOR AREAS

CONTINENTAL CAR-NA-VAR CORPORATION

FIELD TECHNICIANS, OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

CLEAN-O-SHINE	A cleaner of a creamy consistency made from pure linseed oil and is free from alkali, acids, abrasives, and therefore harmless to the finest finish; at the same time it is a highly efficient cleaner. It possesses a very pleasant, sanitary fragrance which has a decided deodorizing effect, eliminates the smell of wet wood, soap suds, etc., as well as other disagreeable odors. If to be followed with Car-Na-Var, Car-Na-Lac, or other finish, floor should be rinsed free of Clean-O-Shine. Approved by Linoleum Manufacturers.	• **Meets U.S. Treasury, Navy and War Department Specifications for "Cleaner A" and Proposed Federal Specifications for "treatments for floor finishes" for Item 1, dated October 1, 1941.**
DE-TER-GO	A white powder, manufactured by a special process resulting in a cleaning agent of most remarkable qualities; a cleaner so mild that it may be handled freely, and yet so powerful, when properly used, that it will remove paint and varnish. For cleaning oil-soaked floors it has no equal, removing the surface oil and restoring the former color of the floor without harming the floor. It is especially adapted for cleaning rubber floors.	• **Meets U.S. Treasury, Navy and War Department Specifications for "Cleaner B" and Proposed Federal Specifications for "treatments for floor finishes" for Item 2, Type II, dated October 1, 1941.**
MAINTENITE	A white powder for cleaning rubber floors. While De-Ter-Go has been approved by leading manufacturers of rubber floors, the general demand is for a somewhat milder cleaner for continuous maintenance and Maintenite was produced to meet this demand. It has been tested and approved by the Rubber Manufacturers Association. It is used exactly the same as De-Ter-Go.	• **Meets U.S. Treasury, Navy and War Department Specifications for "Cleaner B" and Proposed Federal Specifications for "treatments for floor finishes" for Item 2, Type I, dated October 1, 1941.**
FLOR-FIL	A floor filler that will stay on the floor and become a part of the floor. It contains no corn meal or other soft filler but embodies the best qualities of a silex filler with the flint-like hardness of rock. Flor-Fil should be used on new floors of oak, other open grain wood and cork.	• **Meets U.S. Treasury, Navy and War Department Specifications for "Filler" and Proposed Federal Specifications for "treatments for floor finishes" for Item 3, dated October 1, 1941.**
SEAL-VAR	**(For Sealing Oil-Soaked Floors)**—Quick drying seal for oil-soaked floors. Before applying, the surface oil must be removed with De-Ter-Go. Applied with usual applicator (or paint brush), it seals the pores of the newly cleaned floor and prevents embedded floor oil from rising to the surface. Will not mix with floor oil. Dries in an hour. Should be followed with Car-Na-Seal and Car-Na-Lac (or Continental "18"). Coverage: 300 sq. ft. per gal., one coat.	• **Meets U.S. Specifications for "Sealer A" and Proposed Federal Specifications for "treatments for floor finishes" for Item 4, dated October 1, 1941.**
CAR-NA-SEAL	100% Bakelite and similar phenolic resins. A penetrating seal for wood floors—tough as leather and thoroughly pliable—that gives a smooth, satin-like luster, free from streaks and scratches. Such marks as may appear are readily rubbed out. Preserves the floor by excluding moisture and dirt from the pores while protecting the surface from rough usage. Excellent for school desks. Although used frequently as an undercoater for Car-Na-Var, Car-Na-Lac, and Continental "18," Car-Na-Seal is an ideal finish in itself for gymnasium floors. Provides a firm, non-slip, safe-footing. Marks left by rubber soles easily removed. Protects marking of basketball court, etc. Alkali and acid resisting. Quickly applied with a lamb's wool applicator. No buffing required. Coverage: First coat, 400 sq. ft. per gal.; second coat, 600 sq. ft. Original treatment of two or three coats is usually sufficient for entire season for a gym floor.	• **Approved by Maple and Oak Flooring Associations. Meets U.S. Treasury, Navy and War Department Specifications for "Sealer C" and Proposed Federal Specifications for "treatments for floor finishes" for Item 5, Type I, dated October 1, 1941.**

CAR-NA-VAR SYSTEM OF FLOOR TREATMENT

1637 E. NATIONAL AVENUE, BRAZIL, INDIANA

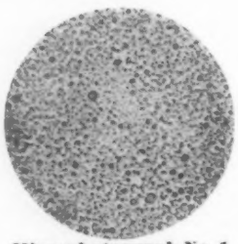
FOR LOCAL OFFICES REFER TO YOUR TELEPHONE DIRECTORY

IN-SEAL	A deep pentrating seal for "raw" wood or other porous surfaces. Made from 100% Bakelite-type resins, it is proof against alkali, acid and moisture. Applied freely with a lamb's wool applicator or paint brush, it sinks into the pores. After thirty minutes, the surplus is wiped off, and after a few hours drying, a second coat is applied and the surplus wiped off. After the second coat is dry, the floor is given a light steel-wooling. The In-Seal has become a part of the floor without leaving a film on the surface. Coverage: 300 sq. ft. per gal., first coat; 400 sq. ft., second coat.	**• Meets U.S. Treasury, Navy and War Department Specifications for "Sealer B" and Proposed Federal Specifications for "treatments for floor finishes" for Item 5, Type II, dated October 1, 1941.**
CAR-NA-PAINT	Made by grinding color pigment into the Car-Na-Seal, giving the same very durable, flexible finish as Car-Na-Seal. Because it is highly alkali and acid resisting, Car-Na-Paint is especially adapted for concrete floors. Applied with paint brush. Supplied in Light Gray, Dark Battleship Gray, Maroon, Dark Brown, Battleship Brown, Tile Red, and Green. Coverage: 400 sq. ft. per gal., first coat; 600 sq. ft., second coat.	**• Color Card upon request. Meets Proposed Federal Specifications for "treatments for floor finishes" for Item 5, Type III, dated October 1, 1941.**
CAR-NA-CRETE	The super-surfacer for concrete floors. Made of rubber. Dries to a hardness 90% the equal of plate glass. Proof against moisture, alkali, gasoline, oils, etc. Resists hydrochloric, nitric, and sulphuric acids up to 50% concentrations. Resists water, heat, cold and abrasion. Perfect adherence—wears like iron but slower to harden than Car-Na-Paint. Supplied in gray, brown, green, and tile red. Applied with a brush or sprayer. Not recommended for outdoor use. Coverage: 400 sq. ft. per gal., 1st coat; 600 sq. ft., 2nd coat.	**• Meets U.S. Treasury, Navy and War Department Specifications for "Sealer D" and Proposed Federal Specifications for "treatments for floor finishes" for Item 6, dated October 1, 1941.** **(Out for Duration)**
CAR-NA-VAR	Easy flowing combination of waxes and varnish gums for all floors except rubber and asphalt. Applied with a wax applicator, it dries in thirty minutes, after which it is brought to a varnish-like gloss by buffing. The varnish content gives adhesion and toughness, the wax content pliability, making Car-Na-Var the longest wearing floor finish available. For use on unsealed or sealed surfaces. Requires more applications to build up a high gloss on a "raw" wood floor, but because of penetration the finish is more permanent than when applied over a seal. Supplied in "Natural" and the following colors: Dark Oak, Light Oak, Walnut, Cherry, Mahogany, Maroon, Green and Mission. (Color card supplied upon request.) Coverage: 1,000 to 1,500 sq. ft. per gal., one coat.	**• Meets U.S. Treasury, Navy and War Department Specifications for "Undercoater A" and Proposed Federal Specifications for "treatments for floor finishes" for Item 7, dated October 1, 1941.**
RUBBER-VAR	Same solid contents as Car-Na-Var made into emulsion form for rubber and asphalt floors. Also excellent for terrazzo floors. Must be buffed, but wears longer than self-polishing water waxes. (Not supplied in colors.) Coverage: 2,000 to 3,000 sq. ft. per gal.	**• Meets U.S. Treasury, Navy and War Department Specifications for "Undercoater B" and Proposed Federal Specifications for "treatments for floor finishes" for Item 8, dated October 1, 1941.**
CAR-NA-LAC	A wax finish for floors made by a new process (patent applied for) which in effect is a lacquer made of wax. Applied with the usual wax applicator, it levels itself out as it dries, resulting in a uniform, streakless, and lacquer-like gloss. It has at least twice the wearing qualities of ordinary water waxes and is waterproof. Adapted for all floors except "raw" wood. Especially recommended as a maintenance finish over Car-Na-Seal. Approved by Rubber Manufacturers Association. Coverage: 1,500 sq. ft. per gal.	**• Meets U.S. Treasury, Navy and War Department Specifications for "Finish Material," except for percentage of solids, and Proposed Federal Specifications for "treatments for floor finishes" for Item 9, Type I, dated October 1, 1941.**
CONTINENTAL "18"	Exactly the same as Car-Na-Lac except that it contains about 38% more solids than the average product of this type. The heavier solid content gives a higher gloss and reduces the number of applications necessary. Approved by Rubber Manufacturers Association. Coverage average about the same as Car-Na-Lac, but one coat does the work of two.	**• Approved for safety by large Casualty Insurance Company. Meets U.S. Treasury, Navy and War Department Specifications for "Finish Material" and Proposed Federal Specifications for "treatments for floor finishes" for Item 9, Type II, dated October 1, 1941.**

The Car-Na-Var System of Floor Treatment is based upon the use of Car-Na-Var Floor Products, a group of superior materials especially designed for heavy duty service and warranted to give satisfaction under a money-back guarantee. In our modern factory, every product is under strict laboratory control from the receipt of the raw materials to the completion of the product. This scientific control insures accurate and uniform results, highest quality being the objective in every case. Prices are made to fit our products—not products to fit prices, and long range economy is the result. Approved by the leading manufacturers of flooring materials, Car-Na-Var Products are stocked in the principal cities with efficient service offices in connection.

CAR-NA-VAR FLOOR TREATMENTS ARE SCIENTIFICALLY MADE

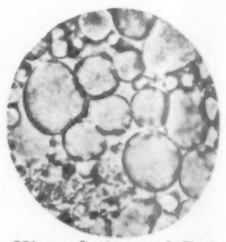
We specialize in heavy duty floor treatments and feature quality. We are incorporated for $1,000,000.00, occupy 60,000 sq. ft. of floor space, have service offices and warehouses in the principal cities. Dun & Bradstreet rates us "B-1". Our products are approved by the leading manufacturers of floors and endorsed by thousands of users.



Microphotograph No. 1

Made under strict laboratory control and out of the best materials, they are specially processed to give maximum results.

The special processing breaks up the globules of varnish gums and waxes into minute particles as shown in Microphotograph No. 1 (magnified 2,000 times). This insures uniformity of coating, better adhesion to the floor and therefore longer wearing, greater safety. Compare our processed products in Microphoto No. 1 with the usual unprocessed products shown in Microphotograph No. 2 (also magnified 2,000 times).



Microphotograph No. 2

WOOD FLOORS—Unfinished (Raw) Wood Floors—For best results, sand, and if oak, fill the open grain with Flor-Fil.

To avoid expense of filling, clean well, removing stains, etc. If not especially dirty, use Clean-O-Shine (also good for all scrubbing purposes)—if very dirty, use De-Ter-Go, wetting small area at a time, sprinkling on De-Ter-Go and scrubbing. Rinse well and when dry, steel-wool to smooth off raised grain. Apply two coats of Car-Na-Seal with lamb's wool applicator (allowing each coat twelve hours to dry). Then apply two coats of Car-Na-Lac or one coat of Continental "18," or to economize in cost and time, omit the Car-Na-Seal and use Car-Na-Var (wax and varnish combined). Apply two coats of Car-Na-Var (allow each coat 30 minutes to dry). Buff each coat to a varnish-like gloss with a buffing machine. (Successive treatments of Car-Na-Var will gradually build up a high, permanent finish. Car-Na-Var is supplied in "natural" and colors.)

Sealed Wood Floors—If floors are already satisfactorily sealed, simply clean them with Clean-O-Shine (using steel wool if very dirty) and treat with two coats of Car-Na-Lac or one coat of Continental "18," or one or two coats of Car-Na-Var buffed with a buffing machine.

If seal is badly worn, best results require sanding and refinishing as for "Unfinished Wood Floors." Apply one or two coats of Car-Na-Seal without resanding, but the floor may be somewhat spotted, since Car-Na-Seal is transparent. Car-Na-Var in color is often used successfully over a worn seal; the lighter, worn spots absorb more of the stain and even up the color of the whole floor. Car-Na-Var will be much cheaper than resanding. It is not recommended for gymnasium floors.

Oiled Wood Floors—First remove the surface oil by wetting limited areas, sprinkling on De-Ter-Go, and scrubbing. Wait a few days for embedded oil to rise to surface and repeat scrubbing operation. Rinse well, and when dry, steel-wool to smooth off raised grain. Then apply one coat of Seal-Var (an oil sealer which dries in an hour) and proceed as for "Unfinished Wood Floors."

When No Surface Film Is Desired—Use In-Seal. Effective only when applied to a porous surface (such as "raw" or freshly sanded wood). Clean floor to remove soiled places and apply two coats of In-Seal with applicator twelve hours apart. Steel-wool when dry to enhance appearance.

Gymnasium Floors—If old seal is not dirty, badly scratched or otherwise defective, steel-wool and apply one or two coats of Car-Na-Seal. If old seal is defective, or worn off in spots, it is best to sand the floor. On a freshly sanded floor, apply one coat of Car-Na-Seal. After allowing twelve hours for drying (longer in wet weather) lay the basketball markings. When markings are dry, apply a second coat of Car-Na-Seal, flowing it on fairly freely. A third coat is not essential from a utilitarian standpoint, but will make a more attractive floor.

Caution: Never use wax on a gymnasium floor. If the floor has been previously waxed, every trace of the wax must be removed before applying fresh seal, or the latter will peel off.

For Dancing—Use boric acid spangles, which make the ideal dancing surface, and which can be removed by wet mopping. Spangles are obtainable at most drug stores.

TERRAZZO FLOORS—Clean with Clean-O-Shine. If "dusting" badly, clean with Clean-O-Shine several times, a few days intervening between each cleaning. Apply two coats of Car-Na-Lac or one coat of Continental "18"; or Rubber-Var, buffed with a buffing machine, will last longer.

LINOLEUM FLOORS—Clean with Clean-O-Shine and apply two coats of Car-Na-Lac or one coat of Continental "18"; or one or two coats of Car-Na-Var, buffed with a buffing machine. (Car-Na-Var in color will restore the color to faded or worn linoleum.)

RUBBER FLOORS—If very dirty, clean with De-Ter-Go or Maintenite. Apply one or two coats of Car-Na-Lac or one coat of Continental "18"; or Rubber-Var, buffed with a buffing machine, will last longer.

(If no wax finish is wanted, use Maintenite for continuous maintenance—a cleaner approved by the Rubber Flooring Manufacturing Association.)

ASPHALT TILE AND MASTIC FLOORS—Clean with Clean-O-Shine. Rinse well and then apply one or two coats of Car-Na-Lac or one coat of Continental "18." If troubled with slipperiness, first clean the asphalt with De-Ter-Go, rinse, and apply Car-Na-Lac or Continental "18." (Clean-O-Shine may be used alone as a maintenance material but requires more frequent use and gives no gloss.)

CORK TILE OR CORK CARPET FLOORS—Clean with Clean-O-Shine. If new, apply one or two coats Car-Na-Var, buffing before it is dry. Or two coats of Car-Na-Lac or one coat Continental "18." If floor is old or if impervious surface is desired, fill cork tile with Flor-Fil and apply two coats of Car-Na-Seal, maintaining with Car-Na-Lac. Treat cork carpet the same, except omit Flor-Fil.

CONCRETE FLOORS—Clean with Clean-O-Shine. If "dusting" repeat cleaning for several days. If oily or waxey, clean with De-Ter-Go, following with Clean-O-Shine. Etch with 10% solution muriatic acid and rinse. Then apply two coats Car-Na-Seal or Car-Na-Paint or Car-Na-Crete (latter requires twice as long to dry). Car-Na-Var, "natural" or stains, is very satisfactory but requires more frequent applications.

With Car-Na-Paint—Clean concrete floors with De-Ter-Go. (If oily or greasy, clean as directed for "Oiled Wood Floors.") Rinse and etch with 10% solution of muriatic acid. Apply acid solution, with sprinkler can or old mop. When floor ceases to effervesce, rinse and let dry. Then apply two coats of Car-Na-Paint (color desired). Allow twelve hours between coats. If floor has been previously painted, steel-wool and apply Car-Na-Paint without etching.

THE NEW SILENT

CAR-NA-VAR VACUUM CLEANER

TRADE MARK REG U.S. PAT OFF

(INDUSTRIAL TYPE)

For Both "Wet" & "Dry" Pick-Up



SO quiet, it can't be heard in the next room . . . yet so powerful, the new Silent Car-Na-Var Vacuum Cleaner can lift a six-foot 2" x 4". Increases "pick-up" efficiency 75%. Never before has a portable heavy-duty vacuum machine offered such powerful cleaning action plus such quiet operation . . . quieter even than a small household machine. Designed for both "wet" and "dry" pick-up, the new Silent Car-Na-Var is the ideal machine for hospital, hotel, school and office where quiet and cleanliness are of equal importance in the daily routine. New compact design makes the Car-Na-Var easier to use, easier to keep clean. New sturdy construction means trouble-free operation . . . longer life.

The Silent Car-Na-Var's amazing increase in pick-up efficiency is accomplished by the reversible double-action nozzle . . . an exclusive Car-Na-Var feature. Special squeegee attachment extends slightly below the bottom of the nozzle, hanging from an axle inside the mouth. When the nozzle is pulled toward the operator, the squeegee flips back, closing the suction behind and diverting it in front where the water or dust is collecting. When the nozzle is pushed away, the squeegee flips in the opposite direction and diverts the suction ahead of it. In each instance, the dust or water "piles up" UNDERNEATH the nozzle where it is quickly picked up. The squeegee attachments vary, depending upon the type of work to be done.

Standard Equipment
includes ten separate attachments.

PRICES:

Dry Pick-Up $225.00
Wet Pick-Up $225.00
Combination $240.00



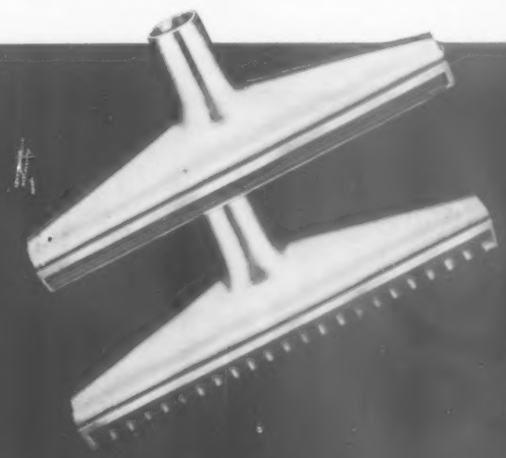
CAPACITY OF TANK 15 GALLONS

Height	2'8¼"
Circumference	3'11⅝"
Weight	50 lbs.
Diameter	15" Inside
H. P.	⅝
Horse Power	⅝

Maximum Floor Coverage—Equivalent space of 1'10" x 1'10". With Casters Turned In—Equivalent coverage equal to a square space 1'8" x 1'8".

Special Squeegee Nozzle Increases Pick-Up 75%





RUBBER OR BRASS SQUEEGEE FOR WET "PICK-UP"

FELT SQUEEGEE OR BRUSH FOR DRY "PICK-UP"

BALANCE AND POWER



SWIFT AND SILENT . . . in perfect balance with entire (concentrated) weight on the brush, the most efficient method of operation. Propels itself, being guided by raising and lowering handle. That's what makes the operation of the Silent Chief so effortless. It's amply powered to give maximum efficiency in high gear, yet so easy to operate that a woman can run one all day long without tiring. So noiseless in operation, the Silent Chief has been adopted by countless hospitals and public buildings where the comfort of patient or tenant is of paramount importance. Whether used for polishing, scrubbing, steel wooling, sanding, grinding or shampooing, the Silent Chief is the last word in modern floor maintenance efficiency! See it in operation on your own floors. No obligation.

Guarantee

All Silent Chief Floor Machines are guaranteed for one year against defective workmanship and parts.

FELT BUFFING PAD

Placed under polishing brush removes "brush rings" from polished floor.

14"	$2.50
16"	3.00
19"	4.00

STEEL WOOL PADS

For removing old wax or "burnishing" new finish to give hard, bright surface.

12"	$ .70
14"	.78
16"	.79
19"	1.03



By lowering wheels, the Silent Chief is easily transported from room to room.

The SILENT CHIEF FLOOR MACHINE

OUTSTANDING FEATURES OF SILENT CHIEF FLOOR MACHINE

SELF-PROPELLING—Minimum effort required . . . operator simply steers . . . an important advantage over the "divided weight" or double brush machines which must be pushed or pulled.

CONCENTRATED WEIGHT—All Weight rests on brush during operation, assuring maximum pressure for best results. No wheel tracks on floor.

HORIZONTAL MOTOR—Permits use under low furniture . . . assures perfect balance and therefore greater ease of operation . . . gears, which wear gradually, can be adjusted because of right angle transition of power. Special grease-packed, geared-head, ball bearing motor assures compactness, silence and efficiency.



GEARS—Although exceptionally quiet in operation, no fibre or plastic gears are used. All gears used in Silent Chief machines are steel against bronze.

SOUND AND DUST PROOF DISC—Prevents dust and dirt from getting into chain drive and sprockets. Silences motor noise made by chain and sprockets.

CASTINGS—Strongly constructed and capable of withstanding abuses to which they should never be subjected. Exposed aluminum castings are highly polished. Brush brackets and brush hub castings are machined to fit perfectly. Aluminum base castings are ribbed underneath and reinforced with ¼-inch steel plate for strength and for absorbing sound.

SAFETY SWITCH—When the operator's hand is removed, the switch automatically opens and motor stops. Eliminates possibility of accidents from carelessness or forgetfulness.

ELECTRIC CORD—Heavy duty rubber covered cord approved by Underwriters. Non-breakable rubber plug and Hubbel connections.

SOLUTION TANK—A detachable solution tank, for scrubbing, can be fastened to the handle of the machine. Flow control is within easy reach of the handlebars.

(Illustration at right.)



FLOOR SCRUBBER		RUG SCRUBBER
Model 200	$205.00	$218.00
Model 300	251.00	267.00
Model 400	282.50	Not Made
Model 500	317.50	Not Made

ATTACHMENTS

Attachments are slipped into place on the Silent Chief in a few seconds' time. They are firmly held in place by a positive locking device—yet disengage instantly when properly released.

Prices are listed downward at right of attachment in following sizes: 12 in., 14 in., 16 in., 19 in. Where prices are not designated, not made.



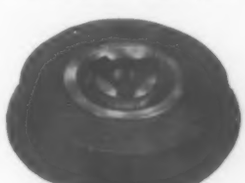
$5.25
6.30
6.90
8.75

ASSINE SCRUBBING or PALMETTO WAXING or TAMPICO POLISHING BRUSHES



$ 7.25
8.30
9.40
11.75

STEEL WIRE BRUSH
Steel Wire Brush. For scrubbing concrete floors and removing varnish.



$00.00
16.80
17.65
00.00

U. S. Pat. 2039356
WHIRL FEED CARPET SCRUBBING BRUSH
Interchangeable brush fillers



$00.00
20.30
21.15
00.00

U. S. Pat. 2021608
CENTRIFUGAL CARPET SCRUBBING BRUSH
All aluminum back.



$0.00
5.55
6.40
8.25

SANDING DISC
For sandpapering wood or cork tile floors.

FIVE POPULAR MODELS—BRUSH SIZES 12" TO 19"

Prices quoted below are delivered in U. S. A. and include only one polishing or scrubbing brush.



MODEL 100
12 inch brush spread.
40 foot cord.
Weight 60 lbs.
¼ H. P. Motor.
$151.00

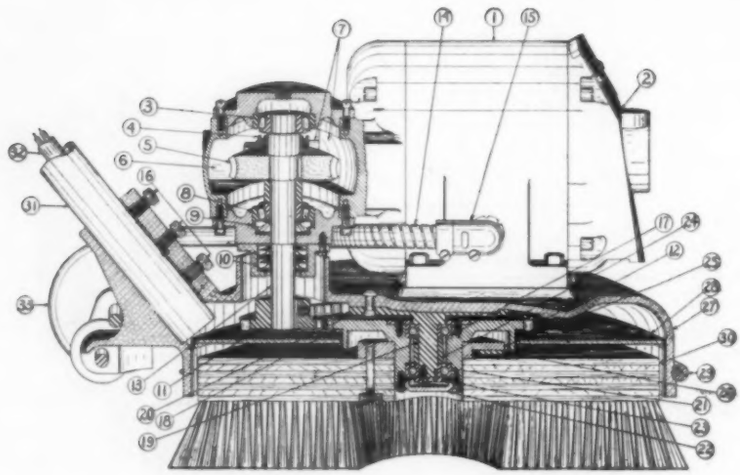
MODEL 200
14 inch brush spread.
40 foot cord.
Weight 67 lbs.
¼ H. P. Motor.
$172.00

MODEL 300
16 inch brush spread.
40 foot cord.
Weight 91 lbs.
⅓ H. P. Motor.
$218.00

MODEL 400
19 inch brush spread.
40 foot cord.
Weight 112 lbs.
½ H. P. Motor.
$250.00

MODEL 500
19 inch brush spread.
50 foot cord.
Weight 155 lbs.
¾ H. P. Motor.
$286.00

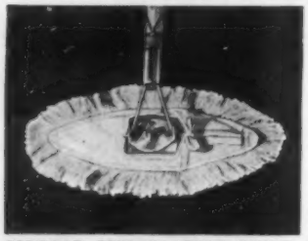
Meet Federal Specifications W-M-46 and 46-A and EWM-46A



1. Special Geared Head Motor, ball bearing, continuous duty.
2. Drip, Splash Proof Motor front.
3. Heavy upper Timken Bearing.
4. Right Angle Spiral Driver Gear.
5. Right Angle Spiral Gear. Meshed into driver gear for speed reduction.
6. Lubricant reservoir.
7. Armature Shaft and Grease Seal.
8. Lower Timken Bearing.
9. Countershaft Grease Seal.
10. Countershaft Leather Oil Seal.
11. Countershaft Steel Drive Sprocket.
12. Roller Chain ½" pitch.
13. Steel Countershaft.
14. Flexible Steel Conduit.
15. Motor Conduit Connector.
16. Square Head Set Screws Adjust Handle.
17. Upper Roller Bearing for Brush Sprocket.
18. Heavy Cast Iron Brush Driving Sprocket.
19. Steel Brush Sprocket King Pin (Shaft).
20. Steel Base Casting Reinforcement Plate, welded to King Pin and riveted to base casting. Large Lock Nut on top of base casting makes King Pin immovable.
21. Lower Roller Bearing. (Same as Upper.)
22. Sprocket Assembly, bottom cap grease retainer.
23. Brush Sprocket Bearing King Pin Cap.
24. Brush Sprocket Bearing Spacer.
25. Brush Bracket, machined to insure a perfect fit and balance.
26. Spring Steel Brush Driving Dog (3 on each machine) forms efficient fit with Brush Bracket.
27. Heavy Aluminum Base Casting, thick enough to withstand greatest strain.
28. Aluminum Felt Padded Sound Disc. Protects chain and sprockets.
29. Rubber Bumper, durable and "marproof."
30. Wood backs of Brushes—are 7 ply laminated waterproof, warp proof wood.
31. Efficiently bent 1¼" handle column pipe.
32. Heavy duty rubber covered, 2 conductor cords, length 40 to 50 feet.
33. Solid rubber adjustable wheels.

CAR-NA-VAR No. 18 APPLICATOR

Faster than Lamb's Wool mop for applying Car-Na-Lac, Continental "18" and Rubber-Var. Wedge shaped head easily gets into all corners; self-adjusting handle, which permits the flat head to lie almost parallel with the handle, allows this mop to go under very low furniture, under radiators, etc. This handle adjustment also allows the mop to operate at any angle — ALWAYS WITH THE MOP HEAD FLAT ON THE SURFACE. Easily cleaned. Made in 2 sizes: 9 inches and 12 inches.



CAR-NA-VAR LAMB'S WOOL MOP

A special mop having a high grade lamb's wool face made especially for applying Car-Na-Var, Car-Na-Seal, Seal-Var, also for applying Rubber-Var, Car-Na-Lac, Continental "18" and Flor-Fil. The Lamb's Wool Pad is readily replaceable at 90c. 10 inch spread.



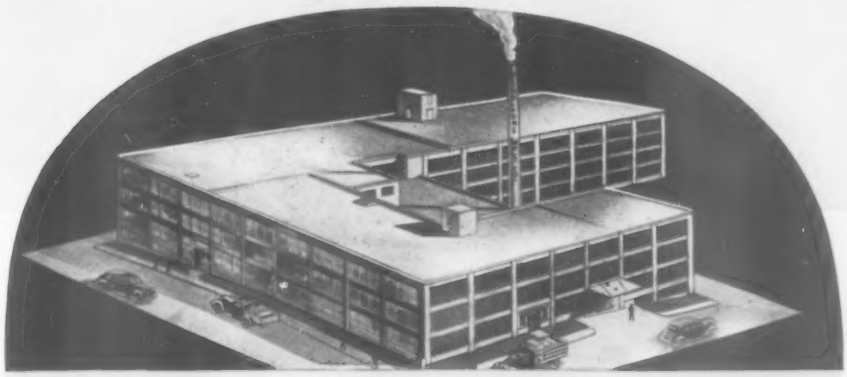
CONTINENTAL CAR-NA-VAR CORPORATION

1637 EAST NATIONAL AVENUE

BRAZIL, INDIANA

World's Largest Specialists In Heavy Duty Floor Treatments

J. I. HOLCOMB MFG. COMPANY.



USE CLEANING TOOLS and CLEANING CHEMICALS BUILT TO WORK *TOGETHER!*

For half a century we have studied cleaning tools and cleaning chemicals. You can learn much about them, and the problems they must solve, in that time. Special tools and chemicals built to do specific jobs—built to the specifications of the men who use them—built to work ***together*** . . . help solve your manpower problem by doing a ***good*** job FASTER. Invest in tools built to work together . . . you'll have a cleaner institution at a lower ***labor time*** cost.

1896 Fifty Years In Business 1946

for

QUIET, SANITARY SWEEPING IN LOBBY, CORRIDORS, and ROOMS on GYMNASIUM FLOORS



for

QUIET, SANITARY SWEEPING IN LOBBY, CORRIDORS, and ROOMS on GYMNASIUM FLOORS

The Holcomb Dustless Yarn Sweepers

SWEEPS «» DUSTS «» POLISHES . . . IN ONE WIDE, FAST STROKE!

Cleans, dusts, polishes—QUIETLY—and its chemically treated yarn ***holds*** the dust and dirt until shaken out. Heads of long, staple cotton sewn on heavy fabric are removable, interchangeable and easily laundered. Can be re-treated with Nu-Finish after washing. It SPEEDS cleaning!

After Laundering — Re-treat with Holcomb Nu-Finish.

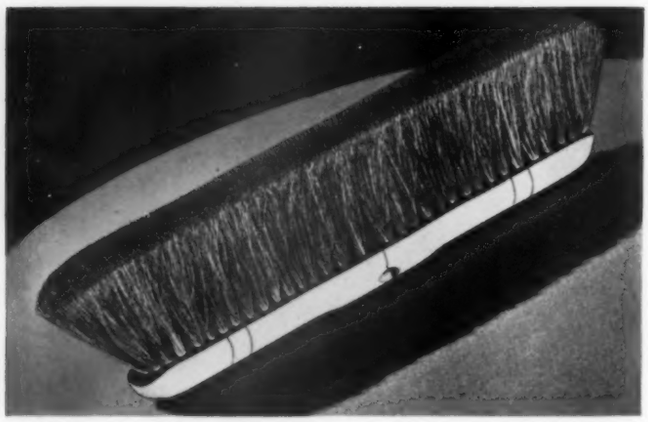
Complete Block and Handle with Heads	Heads Only
No. 412 — 12" block	No. 413 — 22" yarn spread
No. 414 — 14" block	No. 415 — 24" yarn spread
No. 418 — 18" block	No. 419 — 28" yarn spread
No. 424 — 24" block	No. 425 — 34" yarn spread
No. 436 — 36" block	No. 437 — 46" yarn spread
No. 442 — 42" block	No. 443 — 52" yarn spread

For "Floor Maintenance Bulletins" see Page 7

Holcomb tools work faster . . . clean more thoroughly he first time over . . . make money by cutting maintenance time. If your Holcomb tool saves only one hour of cleaning time each day, that is a new profit of $182.50 a year . . . on each man (at 50c an hour).

© 1946. J.I.H.Mfg.Co.

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

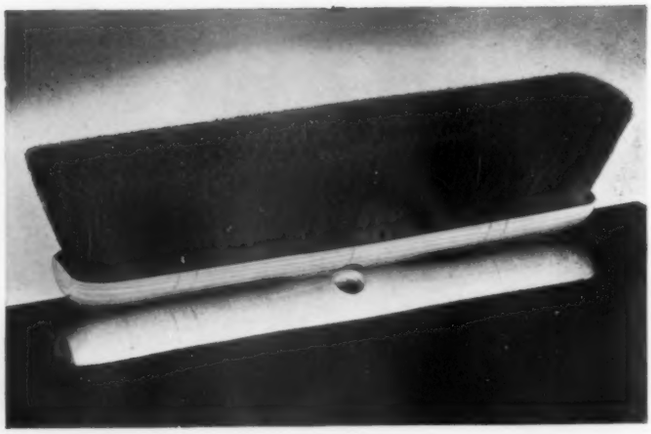


for Sweeping Smooth Floors where Fine and Medium Dirt Prevail

. . . The "UNIVERSAL"

An undisputed leader in all institutions where smooth floors with fine and medium dirt prevail. The combination of springy, dirt digging bristles of Russian and Siberian stock plus the stiff hair mixture insures effortless speed in every "once over" stroke.

Grey stock 3⅞ in. out of block. Sizes 12-14-16-18-24 inch blocks 2¾ in. wide. Handles included.



for Sweeping Smooth and Medium Floors

. . . The "RACER"

Stock center is hair and fiber—outer casing is all snappy, selected hair for keeping fine dirt ahead of the brush. Each hair **sweeps** because full stock keeps it working with the end only. Stock 3⅛" out of block. 14-16-18-24 inch blocks, handles included. ***Machine Set.***



Designed and built FOR

SCHOOLS AND UNIVERSITIES

. . . The "MEMPHIS"

FAST FLOOR SWEEPER FOR MEDIUM AND HEAVY DIRT

This ideal all around school sweeper, the Memphis, makes short work of heavy, stubborn soil. The center stock is of stiff dirt moving fibers surrounded by an aggressive outside casing of bristle. The Memphis will save hours of sweeping time. It moves more dirt in LESS TIME and with LESS EFFORT—it saves dollars as well as manpower. In 12-14-16-18 and 24 inch blocks. Stock 3⅜ in. out of block.

Handles included.

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

HOLCOMB ITEMS Built to Work Together



A HOLCOMB LIQUID FLOOR CLEANER . . —*and*— . . . .



No. 4066 HANDLE SCRUBBER



WATER PROOF WAX . . . . . —*and*— . THE HOLCOMB DUSTLESS YARN SWEEPER



for Dusting the Hard-to-get-at Places FAST . . .

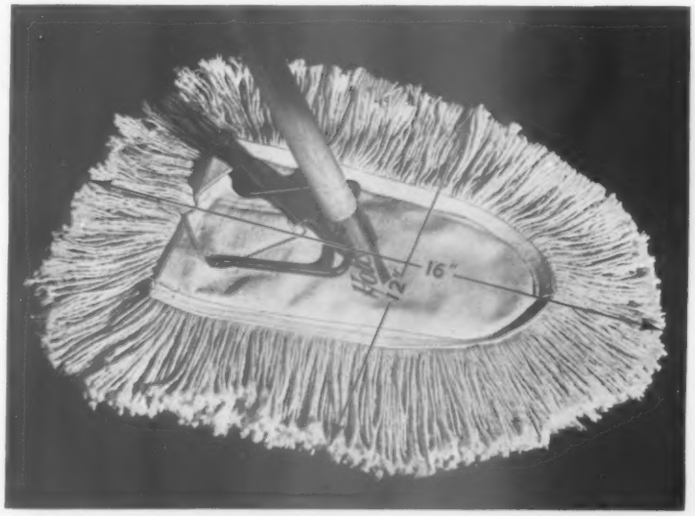
The No. 340 DUSTER

At any angle you hold the Holcomb 340 for dusting woodwork, floors, door casings, walls or ceilings —the face is always *flat* on the surface. Covers and cleans *more* surface, *faster*. Chemically treated soft cotton strands sewn on heavy canvas—slips easily on sturdy frame. Easily laundered and re-treated with Nu-Finish.

No. 340—*Mop frame and head complete*

No. 341—*Mop head only*

No. 342—*Two 341 heads on double frame complete*





The No. 341 Used as a MITTEN DUSTER

. . . makes for fast, efficient dusting . . . the chemically treated yarn picks up and holds more dust. Canvas back protects hands. A "swipe" and it's dusted.

***Re-treat Yarn Dusters and Sweepers with Holcomb* NU-FINISH**

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

Holcomb PURITINE

The 3 INGREDIENT CLEANING COMPOUND

① **Dirt and Grease Solvent**
② **Free Rinsing Agent**
③ **Water Softener**

No matter where you clean with water—use PURITINE. It is universal in its uses—floors, walls, woodwork, painted or varnished surfaces, in the laundry, the kitchen. It will harm no surface . . . is free rinsing, leaves no soapy film and cleans FAST with little washing. It acts fast on the heaviest grease and dirt, costs only a penny a pail and goes 3 times as far as ordinary cleansing compounds.



PURITINE 100% ACTIVE 100% SOLUBLE

Makes YOU Money by Cleaning FASTER and EASIER and by Going 3 Times as Far as an Ordinary Cleaner

In 325 lb. Bbls., 150 lb. Half Bbls., 60 and 30 lb. Drums

THREE HOLCOMB LIQUID CLEANERS

VITA-PINE

***Ideal For Removing* RUBBER "BURNS"!**

Vita-Pine cleanses all floors, woodwork, painted walls, furniture or any washable surface SPEEDILY and leaves a refreshing pine odor. It takes only ONE-HALF pint to a bucket of water to do the normal job. As a neutral cleansing and deodorizing agent, it is tops.

V. C. C. (VITALIZED CLEANING COMPOUND)

for that TOUGH Floor or Wall Cleaning Job.

SOAP CLEANER . . . *a NEUTRAL Type Liquid*

Floor and Wall Cleaner.

In 55 - 30 - 15 - 5 gal. Drums

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

Holcomb

LIQUID WATER-PROOF WAX IS WATERPROOF!

"for more BEAUTIFUL FLOORS"

Not Merely Water Resistant



Make This Water Test Yourself!

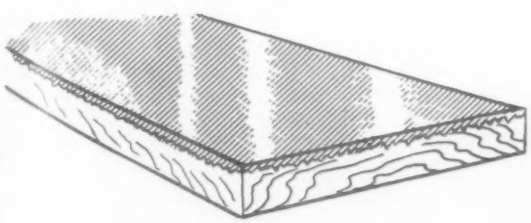
Holcomb Water-Proof Wax Lasts Longer, Patches Perfectly

Water was dropped on each of the six dry spots of wax on this test glass. ***No. 1 is Holcomb Water-Proof Wax.*** After standing for a few minutes, 5 of the wax spots had emulsified. When wiped off with one hard stroke (as shown by the streaks on the glass), wax came off 5 of the spots. The grey spot on Wax No. 1 (caused by the hardness of the water used) disappeared in about 10 minutes. Holcomb Wax can be ***wet mopped.*** It is clear, brilliant and protects your floors LONGER. It cuts down number of waxings in a year and, in addition, it ***patches perfectly in traffic lanes.*** It is TOUGH—ELASTIC and does NOT CHIP.

Use Holcomb WATER-PROOF WAX to coat your floor and keep it immaculate and glistening with the Holcomb DUSTLESS YARN floor sweeper which sweeps—dusts and polishes in a once-over stroke. Cut maintenance time in two with Holcomb Water-Proof Wax and DUSTLESS YARN sweeper on the job.

In 55 - 30 - 15 - 5 gal. Drums

SEAL-COAT ...*The Perfect SEAL for Wood Floors*



IT PENETRATES!

You Must Wear Off the Wood to Wear Off the SEAL-COAT

Seal your wood floors, whether new or old, with Holcomb Seal Coat. It PENETRATES! It brings out the natural color and grain of the wood and protects the surface. Seal Coat, in penetrating, combines with the wood to form a new, protective ***tread.*** It is more easily swept because the grain of the wood is filled. That speeds the sweeping job. Your floor may be waxed also. Using Holcomb Water-Proof Wax on a sealed floor gives it greater beauty, makes it more durable and makes for less maintenance cost.

In 55 - 30 - 15 - 5 gal. Drums

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**



A "one-armed" man, with Holcomb Window Cleaner, can clean a window as fast as a two-armed man with the ordinary window cleaners.

for Windows . . . Glass Cabinets, etc.

Holcomb WINDOW CLEANER

SPRAY IT ON—WIPE IT OFF—and you have a sparkling, brilliant glass surface—no film and you've done the job in half the usual time. Here is a Holcomb product that is helping to relieve the manpower shortage in building maintenance everywhere.

1 gal. bottles and cartons of 4 1-gal. bottles

Holcomb WHITE STREAK *Quick-as-a-Flash!*



for BATHTUBS, URINALS, WASHBOWLS, SINKS, ETC. . . . of Porcelain, Tile, Enamel, or Granite . . . IT'S FAST

Another time and labor saving cleanser is "quick-as-a-flash" WHITE STREAK. One swipe and the dirt's off. Especially good for rest room fixtures and college and school utensils of enamel, granite, etc. White Streak cleans so thoroughly (on tile walls, for example) that things stay clean longer.

275 lb. Bbls., 80 lb. Kegs, 25 lb. Drums
(Cartons of 6 1-lb. Shaker Cans)

The No. 15 MOP

. . . IT HOLDS *MORE* WATER

The Holcomb No. 15 Mop is the result of years of experience and experimentation. IT HOLDS MORE WATER! That means fewer trips to the mop bucket. It is a strong, most absorbent, "lintless" mop. The long, strong, absorbent strands have no linters to pull out. It mops more floor surface per trip to the bucket and—it picks up more water per trip from floor to bucket. This means ***faster*** mopping with less labor and that means lower mopping cost per classroom!



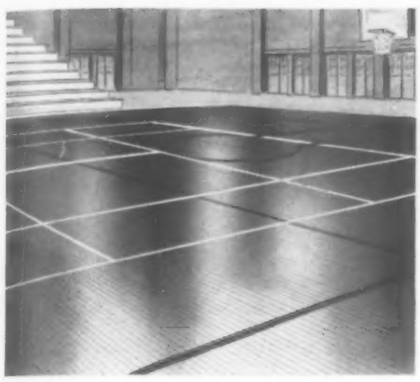
No. 15 MOP HEADS

16 oz. heads, 6½ x 17"
20 oz. heads, 6½ x 17"
24 oz. heads, 7 x 19"
32 oz. heads, 7 x 21"

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

Holcomb GYM FINISH

IT'S MADE TO "TAKE" IT!



One of the most ***enduring,*** mirror-like gym finishes. It takes untold abuse without injury to the appearance of your floor. It covers 600 to 800 sq. ft. per gallon . . . and gives you—

- ***a Natural Color Floor***
- ***a Mirror-like Finish***
- ***a Slip-preventive Surface***
- ***a Rubber Burn Resistant***
- ***a Floor Easily and Economically Maintained***

In 55, 30, 15, 5 Gallon Drums

VITA-PINE . . . *Ideal for Removing Composition Rubber "Burns"*

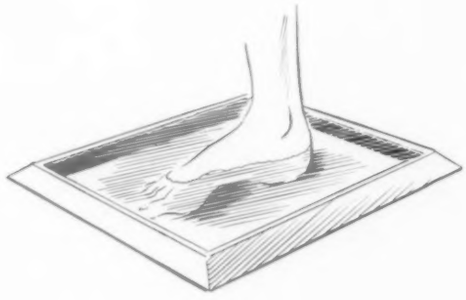
PINE-OLA Disinfectant *and* Deodorant

Why bother with two, three or four different solutions for disinfecting and deodorizing when all-purpose Pine-Ola will do the whole job? From rest room to garbage cans, it's ***the*** ALL purpose, money saving solution.

In 55, 30, 15, 5 Gallon Drums

Holcomb FOOT-BATH FUNGICIDE

...A Preventive Against Spread of "Athletes Foot"



"FUNGICIDE" is a liquid concentrate, the diluted solution of which ***KILLS*** the fungus causing "Athlete's Foot". It does not bleach, stain or irritate. Use it in foot baths in shower rooms, locker rooms, gymnasiums, swimming pool rooms. Can be sprayed or mopped for a disinfectant. Dilution: 1 part to 100 parts of water. ***Non-corrosive.***

In 55, 30, 15, 5 Gallon Drums

Write for any of these *Floor Maintenance* Service Bulletins . . .

Asphalt Tile	**Cement**	**Linoleum**	**Marble**	**Slate**	**Tile**
Composition	**Cork Tile**	**Magnesite**	**Rubber**	**Terrazzo**	**Wood**

The J. I. Holcomb Mfg. Co. maintains this Research Laboratory and its staff for the advancement of the science of cleaning and maintenance. The Bulletins above on correct, money-saving floor maintenance, are only one of the many services it renders you. If you have a cleaning problem—write the Holcomb Research Laboratory. They will help you solve it . . . satisfactorily.

—From Research Laboratory of the J. I. Holcomb Mfg. Co.
Cold Spring Road, Indianapolis 7, Indiana.

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

Holcomb SPECIAL ITEMS



No. 6 TOILET BRUSH

This famous Holcomb tool has the stiff wings that get the scum under the rim. Straight handle for an all around the bowl stroke without changing grip. A clean bowl is odorless.

Use It with "BOWL CLEANER"

Regular use of Holcomb Bowl Cleaner keeps toilets free from discoloration, scum and lime. The No. 6 and Bowl Cleaner make a perfect Holcomb team.

STOP-GO . . . *Keeps the plumber out of your DRAINS!*

Stop-Go dissolves or loosens foreign matter which clogs drains, grease traps, toilets, wash stands, shower drains, etc. One can dissolved in 2 qts. of boiling water opens a stopped drain in 2 to 10 minutes.



No. 16 BENCH DUSTER

5 *Dusters in ONE!* Saw yourself a "new" bench duster when the end bob wears down. The No. 16 cleans benches, chalk rails, desks or ANYTHING, ***FAST!*** "Bob" constructed for strength, each bob an individual unit, "flared" and full of snap.

METAL LUSTER . . . *Liquid Metal Polish*

cleans and polishes ALL metal surfaces with little or no rubbing. Brass, Copper, Stainless Steel, Bronze, Nickel. Merely apply—wipe off with ***clean*** soft cloth. It's SPEEDY!



FLOOR TREAT

SPRAY IT ON—
SWEEP IT OFF!

MAINTAINS WOOD FLOORS FOR LESS!

For treating unsealed wood floors and in maintaining varnished wood; Linoleum, Rubber, Composition, Tile, Terrazzo, etc., and waxed or unwaxed surfaces of wood or steel. Restores natural finish and builds up a glossy surface. Your floors sweep FASTER!

DISHWASHING COMPOUND

For ***machine*** dish washing ONLY! It's FAST . . . and free rinsing without leaving soapy film. No scale in machine. Economical, one-half oz. per gallon of water. Dishes and glassware remain free of deposits and water marks.



FRESHETTES . . . *Rest Room Deodorant*

They are for ONE purpose only. Holcomb FRESHETTES ***replace*** objectionable odors in lavatories and urinals with a pleasant fragrance. Insoluble in water. 6 to a can. Cartons of 4 and 12 cans.

"INSEKIL" . . . *for* FLIES - BUGS - ROACHES

It's for Flies, Moths, Mosquitoes, Ants, Roaches, Bedbugs, Water Bugs, Spiders, Centipedes. Knocked down 100% of flies in 10 minutes (Peat-Grady Test).

J. I. HOLCOMB MFG. CO. *"Cleaning Headquarters"* **INDIANAPOLIS-NEW YORK**

THE FULLER BRUSH COMPANY

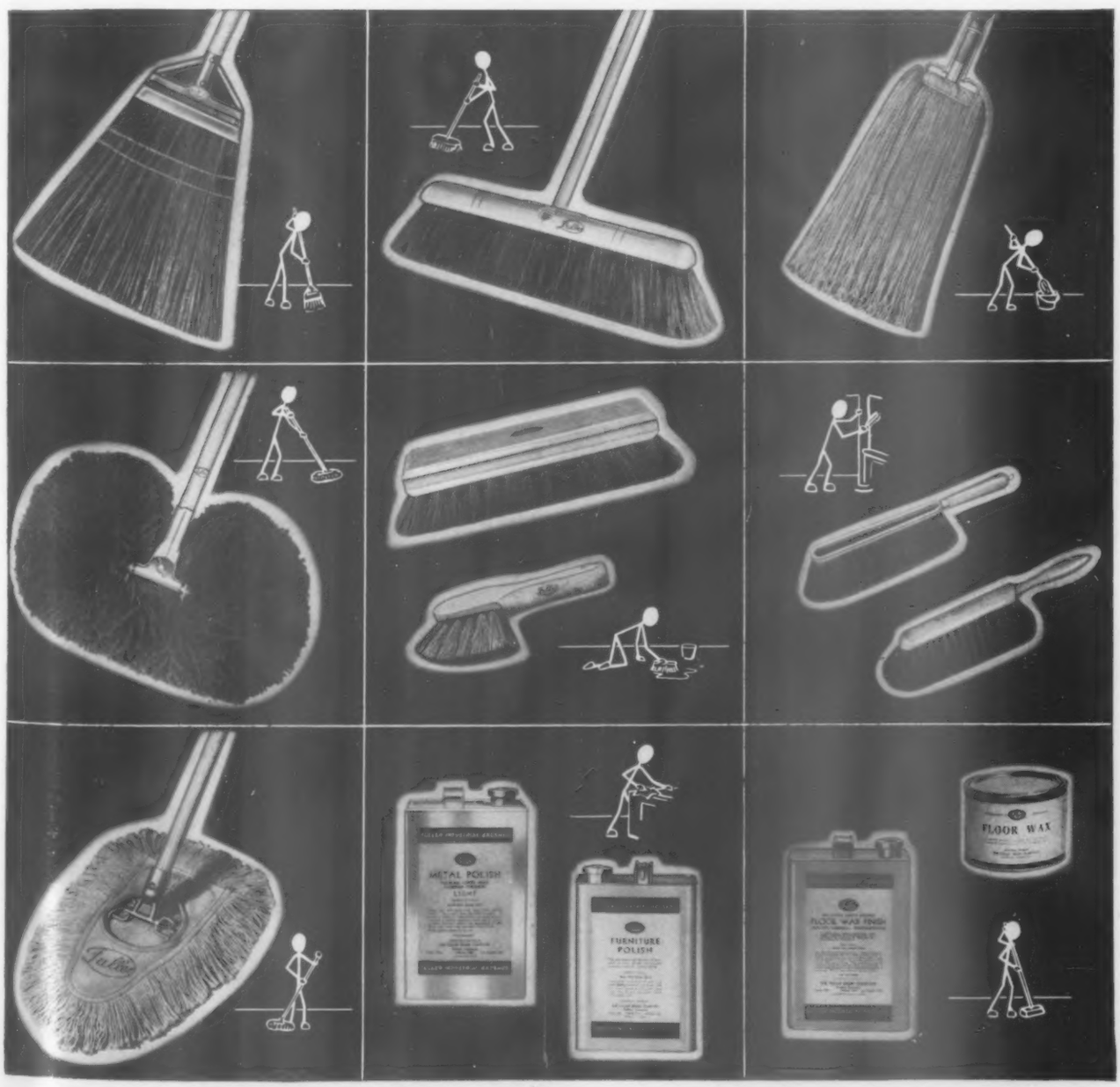
INDUSTRIAL DIVISION — DEPT. 60
Hartford 2, Connecticut

FOR A FASTER BETTER CLEANING JOB I ALWAYS USE FULLER BRUSHES



• Designed to do more efficient work with less effort. Fuller Brushes have been the favorite for many years in leading schools and universities throughout the country. They do a better job and last longer because they are carefully constructed of the finest materials.

Fuller Cleaning Equipment is available to meet every cleaning need. **Assure** your school of the best. Write for the Fuller catalog today.



THE SELIG COMPANY, INC.

DALLAS ATLANTA NEW ORLEANS

Manufacturing Chemists

Floor Finishes — Polishes — Disinfectants — Insecticides — Sanitary Products

ESTABLISHED 1896

SCRUBZOL

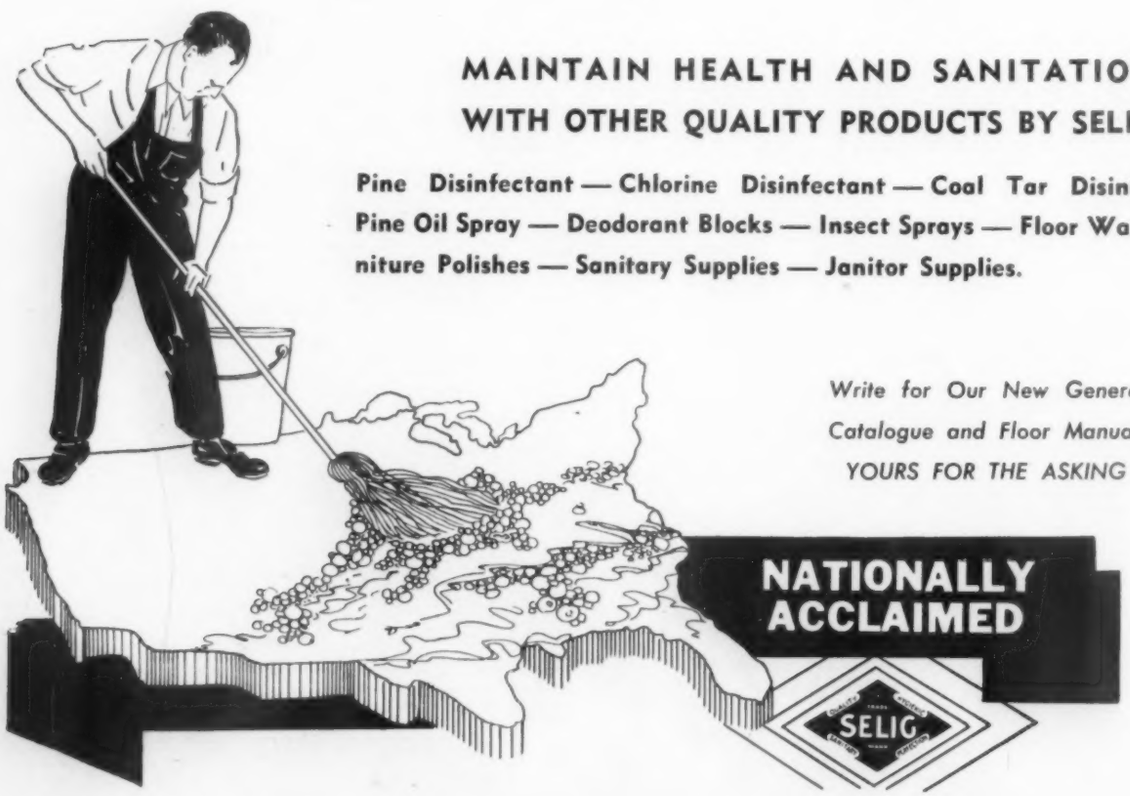
A Neutral Liquid Cleanser for All Types of Floors, Approved by Leading Flooring Manufacturers

Scrubzol is the choice of many architects and building managers because it cleans, brightens and protects the floors, impressively revealing the original colors. These results are brought about because Scrubzol softens the dirt and loosens the grease and grime without hard scrubbing, and since all floors are more or less porous, Scrubzol penetrates the pores of the floor causing the impregnated dirt and grime to become dissolved, forcing it to the surface where it is easily rinsed away.

Scrubzol should be used for all types of floors. It cleans, brightens and preserves linoleum, linotile, cork, rubber, asphalt, terrazzo, marble, magnesite, masonite, quarry tile, wood and concrete floors.

Scrubzol is a harmless chemical cleanser that is neutral, contains no acid, grit or free alkali yet is fast in its cleaning action and is completely soluble in hot or cold water. Scrubzol liquefies dirt, grease and grime, is a free rinse economical cleanser, and should be diluted two ounces to the gallon of water.

★ ★ ★



MAINTAIN HEALTH AND SANITATION WITH OTHER QUALITY PRODUCTS BY SELIG

Pine Disinfectant — Chlorine Disinfectant — Coal Tar Disinfectants — Pine Oil Spray — Deodorant Blocks — Insect Sprays — Floor Waxes — Furniture Polishes — Sanitary Supplies — Janitor Supplies.

Write for Our New General Catalogue and Floor Manual. YOURS FOR THE ASKING

NATIONALLY ACCLAIMED

SELIG

JIM-KOTE

ALL THE WORLD LOVES A WINNER



SUPER GYM SEAL AND FINISH

Help your team to be a champion. School executives and coaches recommend Jim-Kote to provide a gym floor that will keep your team in the championship class.

Jim-Kote gives you a smooth resilient playing floor surface that is tough, durable, splinter free and fast, yet free from the usual slip hazards found in so many gymnasiums that slow down play and ofttimes cause injuries.

Your gymnasium floor correctly surfaced and properly maintained is a thing of beauty. Jim-Kote beautifies and protects the floor so that it may be a center of campus activities and in addition to athletic events can safely be used for entertainments, banquets, dances, oratorical contests and other gatherings without damage or injury to the floors.

Jim-Kote dries hard, thus seals the pores of the wood preventing the penetration of foreign matter so that surface dirt is easily removed. Jim-Kote is easily applied and may be used on any gymnasium floor . . . new or old . . . quickly putting it in excellent playing condition. Jim-Kote is a transparent durable bakelite seal and finish that will not chip, crack, peel or blister. Average of three coats is about 650 square feet per gallon.



SELIG'S GYM CLEANER

Synthetic and reclaimed rubber soles and heels play havoc with nicely finished gym floors.

Such scuff marks and rubber burns can be easily cleaned off with Selig's Gym Cleaner. Proper daily maintenance of your gym floor will increase its life of service and provide a good playing surface. Use Selig's Gym Cleaner and keep your gym floor in a good clean condition.



QUALITY TRADE HYGIENIC SELIG SANITARY MARK PERFECTION

WEST DISINFECTING COMPANY

42–16 West Street, Long Island City 1, New York

BRANCH SALES OFFICES

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AND PRINCIPAL CITIES IN CANADA

WESTONE REMARKABLE NEW LABOR SAVING PRODUCT THAT SIMPLIFIES FLOOR MAINTENANCE



WESTONE IS . . .

a chemical floor treatment in liquid form which penetrates and blends with the floor material to form a hard-wearing, waterproof surface which helps to prevent grit, sand or dirt from being ground into the floor by foot traffic. Westone is not a floor oil and will not become gummy or sticky. It penetrates rapidly and evenly and unlike many other floor treatments, actually becomes a part of the floor material itself.

WESTONE PREVENTS FLOOR WEAR

because it brings a hard finish to a sealed wood floor which makes the seal permanent. It gives a tough protecting film to wood floors which makes the floor last much longer. To highly porous terrazzo, tile, composition and marble floors, Westone brings a positive binding action which helps prevent disintegration, erosion and decay.

HOW WESTONE CONTROLS DUST

The presence of dust in room atmosphere is due not so much to open windows as it is to floor traffic. When traffic is continuous dust never settles on the floor so the problem is to keep the dust from rising. Westone has, in addition to its other properties, a peculiar affinity for dust and where it is properly used to maintain a floor, the atmosphere will be comparatively free from it because foot traffic will not cause the dust to rise.

IMPROVES APPEARANCE

Different than most floor treatments which are put on a floor and then not applied again until their protective action has been outworn, Westone, if used as directed, will continuously improve the appearance upon each regular application.

THE LOW COST

Two factors make Westone economical to use. Ease of application enables one person to do the work of three in maintaining floors and, because Westone is highly diffusive, a small amount gives enormous coverage. On a sealed floor, one gallon covers 4,000 square feet when first applied. These two factors actually make the cost of maintaining floors with Westone less than with the old soap and water method.

NEW USE FOR WESTONE! CLEANS BLACKBOARDS

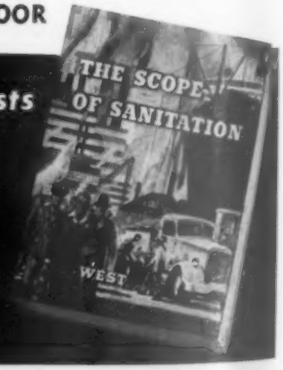
Wipe blackboard with cloth dampened with Westone. Wipe off excess with a clean dry cloth. Allow blackboard 12 hours to dry. Results will be amazing

WESTONE CAN BE USED ON CONCRETE OR ANY TYPE WOOD FLOOR

Other West Products Designed To Reduce Maintenance Costs

- Liquid Soap and Dispensing Systems
- Disinfectants and Deodorants
- Insecticides and Raticides
- Paper Towels and Cabinets
- Kotex Vending Machines
- Cleansers
- Floor Finishes

FREE Copy of this catalogue on request.



WEST DISINFECTING Company

Dept. BU, 42-16 West St., Long Island City 1, N. Y.

THE WILBUR & WILLIAMS COMPANY

Dept. 64 — Park Square Building, Boston, Mass.



3 TROUBLESOME PROBLEMS YOU CAN NOW FORGET

The WILBUR & WILLIAMS COMPANY

Rusting Metal
Cornices—Fences—Steel Sash

Forget your troubles with rust. Even over rusted and damp metal Totrust gets down to the root of the infection and strangles further growth. You will find the "Penetration Chart" interesting.

TOTRUST and TOTALUME

Concrete Floors
Entrance—Corridor—Basement

Forget that old problem of maintenance for Concrete Floors. The Dye-Crete and Rubber-Coat System assures deep coloring and hardening with a heavy-duty finish, fully resistant to alkali.

DYE-CRETE and RUBBER-COAT

Wet Walls
Lavatory or Shower Rooms

Forget the standard specification which insists that paint can be applied only to dry surfaces. Dampcoat was developed expressly for those places which can never be dried out for normal painting.

DAMPCOAT ENAMEL

RUBBER-COAT

Bringing the qualities you would expect from rubber itself into practical painting use:

1. It's *tough* . . . resists wear like a rubber tire.
2. It's *waterproof* . . . even suitable for pools and tank interiors.
3. It's *chemical resistant* . . . unaffected by alkali, gasoline or strong soaps.
4. Free from *internal aging* . . . lasts longer.
5. *Stops seepage* (unless under pressure).
6. Dries in about *an hour.*
7. Available in many colors.

RUBBER-COAT NO. 310 FLOOR ENAMEL—For concrete or wood floors—a heavy-duty rubber-base product under the proved formula of the Insl-X-Co. Combine RUBBER-COAT NO. 310 with DYE-CRETE Hardener for a time-tested treatment for concrete floors. Unlike anything else on the market.



TOTRUST (Regular Metal Paint Colors) **TOTALUME** (Brilliant Aluminum Coating)

Penetrating, Rust-Preventive Paints

For the protection of all structural metals and equipment. Aluminum and colors. Give lowest cost protection because of:

1. *PENETRATION into rust-pits.*
2. *DAMP, RUSTED SURFACES safely painted.*
3. *RUST STOPPED at its source.*
4. *RESISTANCE to weather, abrasion and fumes.*
5. *AMAZING spreading and covering power.*



DYE-CRETE SYSTEM

For Concrete Floors

Puts the finish IN not ON the floor

DYE-CRETE COLOR HARDENER Dustproofs, hardens and colors the concrete as it penetrates beneath the surface. DEFENSITE COATING or RUBBER-COAT NO. 310 completes the treatment with a tough colorful finish.

1. *COLOR PENETRATES into Concrete.*
2. *COLORS, HARDENS and DUSTPROOFS.*
3. *GIVES A HIGH-RESISTANT ENAMEL FINISH.*
4. *SAFELY APPLIED over DAMP or DRY Concrete.*
5. *MAINTAINS UNIFORM COLOR with wear.*
6. *RESISTS Dampness, Gasoline, Grease and Alcohol.*



PAINTS OVER WET WALLS

DAMPCOAT ENAMEL is especially designed for the tough specific problems of moisture. Here is what DAMPCOAT ENAMEL accomplishes that usual enamels do not—

1. *Safely paints over DAMP Masonry or Wood.*
2. *Has No Odor or Taste to affect Drinking Water or Food.*
3. *Easily maintained to sanitary requirements.*
4. *Does not soften under water.*
5. *Not affected by fumes.*
6. *Non-yellowing. Tough, durable and scrubbable.*
7. *Used to enamel Damp Wells and Tank Interiors.*
8. *Coverage—250-400 sq. ft. per gallon.*

Saves countless hours and expense in painting without shutting down production. Squeezes moisture to the surface, thus eliminating any danger of blisters.

We have prepared a portfolio "INSTITUTION MAINTENANCE"

A postal card will bring a copy to you. This portfolio deals exclusively with the troublesome problems of good maintenance. The "Penetration Chart" shows how rust (even damp) can be stopped

Write for your Copy NOW.

THE BLACKBOARD RESURFACING COMPANY

408 S. Main Street
Bangor, Pa.

New Blackboards from Old!

THESE PHOTOGRAPHS CLEARLY TESTIFY TO THE VAST IMPROVEMENT WROUGHT BY OUR CRAFTSMEN ON OLD SLATE BLACKBOARDS

BEFORE



Classroom, Grade 2, McKinley School (Erected 1909), Mt. Carmel, Pa.

Notice the heavy whitish deposit of "chalk concrete" — impairing writing surface and producing eyestrain. After 37 years of continuous use, the boards were loose, scratched and opened at the joints.

AFTER

The same room after our craftsmen removed the blackboards from the walls and frames, resurfaced and honed the boards (by hand—under water), reset and dressed them.



Slate blackboards do not deteriorate but do accumulate a surface deposit of "chalk concrete" from the wax in chalk, chalk dust, dirt, perspiration, etc. Our quarry-trained and experienced craftsmen resurface and reset blackboards at your schools, without interference with normal school schedules or activities. Your schools can again have beautiful, satin-smooth, easy-writing, black slate . . . An indispensable training aid.

— Manufacturers of **STA-BLAK** — The perfect slate dressing —
— School Representatives for famous BANCORK BULLETIN BOARDS —

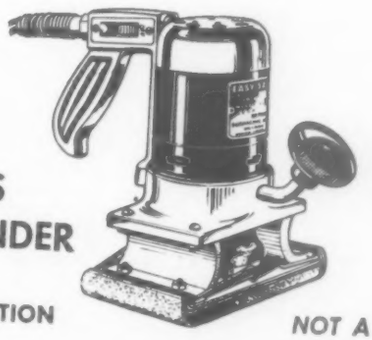
Slate and Cork Contractors
Complete Installation

DETROIT SURFACING MACHINE COMPANY

7456 West Davison Avenue — Detroit 4, Michigan

Proven

IN THOUSANDS OF SCHOOLS TO BE THE MOST *practical* SANDER



Easy

RECIPROCATING ELECTRIC SANDER

★ ★ ★

RECIPROCATING ↔ BACK AND FORTH ↔ ACTION

NOT A DISC OR BELT SANDER

For Resurfacing Blackboards

SLATE OR MANUFACTURED



The EASY sander has proven indispensible for refinishing slate or manufactured blackboards. Also for preparing (sanding and smoothing) wood, plaster, composition and other surfaces to be coated with slating material and used as blackboards.

Restores slate blackboards to original soft, non-glare finish for less than 3c per square foot. Safe, simple operation assures highest quality work even by inexperienced student or handyman. No dust. Work is done without removing blackboards from wall.

For Student Instruction

ON WOOD, METAL, PLASTICS



Train students with the modern sander adopted by industry for sanding, rubbing, polishing, de-burring, "feather-edging." Safe, simple, light weight, vibrationless operation. All mechanism enclosed. Duplicates finishes obtained by hand block sanding because of reciprocating, back and forth, straight-line action. Not a disc or belt sander. Cuts no laps, swirls or gouges. Produces 50 to 80% more work than by hand without sacrificing quality.

For Refinishing Desks & Seats

ALSO LOCKERS & WINDOW LEDGES



A quick, EASY, simple method for economically refinishing all wood, metal, plastic and composition surfaces. Refinishes desks without removing from classroom. "Detachable pads" for finishing CURVED or flat surfaces, WET or dry work.

SPECIAL SCHOOL KIT NO. 900-S, $97.50

Kit contains 4 detachable sanding pads; ¼" felt, ¼" and ⅝" sponge rubber and convex type for heavy cutting work, lubricants and spare parts as listed below:

1 MODEL XL90 Easy Reciprocating Electric Sander
4 Detachable Sanding Pads—as listed above
1 No. 324 Abrasive Holder with anchor plate
1 No. 291 Leather Boot
1 No. 504 Tube drive lubricant
1 No. 501 Tube Gear Lubricant
2 No. 301 Rocker Rolls

OUTSTANDING *Easy* FEATURES

NEW MODEL XL 90

★ VIBRATIONLESS OPERATION ★ RUGGED—ALL BALL BEARING CONSTRUCTION ★ SAFE, FOOL-PROOF. ALL MECHANISM ENCLOSED ★ FASTER CUTTING ★ SIMPLE OPERATION ★ INEXPERIENCED USERS CANNOT DAMAGE WORK ★ SNAP-ON SANDING PADS PRODUCE SUPERIOR FINISH ON *CURVED* OR FLAT SURFACES, *WET* OR DRY WORK ★ LIGHT WEIGHT ★ OPERATES FROM ANY AC OR DC LIGHT SOCKET ★ SHORT STROKE RAISES NO DUST.

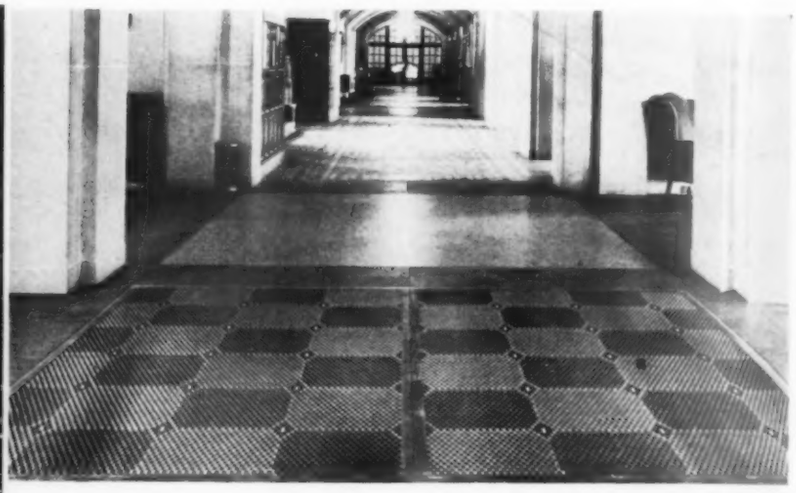
NOTE: *Letters from school users relating their experiences with the "EASY" and offering their opinions, have been compiled in a leaflet. A copy will be sent to you on request.*

Write for further details or SEE YOUR SCHOOL SUPPLY JOBBER

AMERICAN MAT CORPORATION

1700 Adams Street • Toledo 2, Ohio

This is the easy way to SAFETY • SANITATION • COMFORT





America's Largest Matting Specialists Offer

EZY-RUG RUBBER LINK MATTING

Traps all dirt at the door, keeps it out of sight and prevents tracking through the building, reducing cleaning costs and frequency of redecorating necessitated by dirt whirled into the air by the heating system. Modernizes and beautifies entrances, lobbies and corridors. Available with lettering. Non-trip beveled edge. Lies flat. Reversible, its durability is doubled.

AMERITRED Solid Plastic Friction Matting

For ramps, stairs, landings, shower and locker rooms, entrances, in front and back of counters. Good scrapage. Lies flat. Comes in sections 29" x 62" x 9/64". Can be laid side by side for larger areas, or trimmed for smaller or odd shaped areas. Color: black.

AMERICAN Counter-Tred MATTING

Used in lavatories, refrigerators, shower and locker rooms, swimming pools, laundries and behind serving counters. Ridged bottom affords aeration and drainage. 5/8" thick, 24" wide, and in any length.

AMERIFLEX FLEXIBLE HARD WOOD LINK MATTING

The links are held on galvanized steel springwire framework. Lies flat. Follows contour of the floor. Beveled edges. Can be rolled or folded.

SAFETY STAIR TREADS AND RUNNERS • TIRE FABRIC MATTING • PERFORATED AND CROSS CORRUGATED MATTING • SPONGE RUBBER MATTING • STEEL MATTING • GYMNASIUM MATS

Write for prices and folder, "A Mat for Every Purpose"



NATIONAL VULCANIZED FIBRE CO.

Wilmington 99, Delaware



Light-weight, Attractive

VUL-COT WASTE BASKETS

Save money in handling waste

● ***Thrifty for Classrooms, Dormitories, Offices, Lavatories, Locker Rooms and Laboratories***

FOR more than 50 years, VUL-COT Waste Baskets have been widely accepted for school and university use because of their beauty, efficiency of design, and long-lasting durability.

Smart in style and color, they are functionally designed in attractive, practical sizes and shapes for convenient, economical handling of waste.

Because they are made of hard vulcanized fibre, VUL-COT Baskets are unusually strong and wear-resistant—do not split, splinter, dent, crack, rust or corrode. Unusually light weight, they do not mar floors or furniture, are noiseless when handled. No ring or clatter—because they absorb shocks and bumps. Each VUL-COT is fully guaranteed for 5 years and, with ordinary usage, lasts a lifetime.

Write for Price List

VUL-COT "Round Taper"

Popular, practical shape for general use in classrooms and offices. Large in capacity; yet takes up little space. Available in three desirable sizes in rich Maroon-Brown, Olive-Green or Walnut.



	No. 1	No. 2	No. 3
Top diam. ..	10"	12"	14"
Bottom diam.	8"	10"	12"
Depth	12"	14"	16"

VUL-COT "Square Taper"

Smart style. Ideal for reception rooms, libraries or meeting rooms. Made in Maroon-Brown, Olive-Green and Walnut.



	No. 4	No. 5	No. 6
Top .	10½" x 10½"	12" x 12"	14" x 14"
Bottom .	8½" x 8½"	10" x 10"	12" x 12"
Dpth.	14"	14"	16"

VUL-COT "Round Straight"

Tough, spacious utility basket for washrooms, basements, auditoriums, halls and locker rooms. Two sizes in Maroon-Brown, Olive-Green and Walnut.



	No. 9	No. 10
Diameter	14"	14"
Depth	20"	30"

VUL-COT "Oval Taper"

Efficient, convenient for use in limited space. Standard Maroon-Brown, Olive-Green and Walnut.

	No. 11	No. 12
Top	8½" x 10½"	13" x 10½"
Bottom .	6½" x 9½"	11" x 8½"
Depth ..	12"	14"

GUARANTEE

This Vul-Cot *waste basket with ordinary usage should last a lifetime. It is absolutely guaranteed as to material and workmanship for a period of five years from date of purchase, when used only as a waste basket. If during that time in such service it proves defective, return and a new basket will be supplied.*

NATIONAL VULCANIZED FIBRE CO.
WILMINGTON, DELAWARE, U. S. A.

115120

PALMER FIXTURE COMPANY

Waukesha, Wisconsin

Vacuum Eraser Cleaners
Toilet and Towel Fixtures
Liquid Soap Dispensers
Metal Dust Pans

VACUUM ERASER CLEANERS

No child should be expected to soil his clothing or his body; neither should a janitor by the pre-historic manner of cleaning blackboard Erasers. Vacuum electric cleaners are an accepted practice in this sanitary age, and no school should be without them for sanitary reasons and efficiency. Erasers will be cleaner —blackboards will reflect the cleanliness of the eraser, relieving eye-strain and making blackboards more presentable.



MODEL C

There is 25 years of experience manufacturing electric eraser cleaners back of our product.

The Model C is a power driven brush designed to clean thoroughly without undue wear on the felts because of its comparatively low speed, because it is not directly connected to the motor shaft and revolves in a horizontal position to assure that dust will not be thrown about as is the case when brush revolves on a perpendicular shaft.

Cleaning table is adjustable to compensate for wear on the brush bristle, assuring a long-life brush.

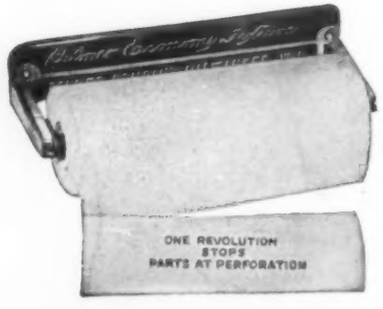
Motor—an especially designed motor of our own, operating on either AC or DC 110 or 220 volts.

Dust bag made from approved and especially woven material and is readily removable for cleaning and emptying. Large opening provides for convenience in this operation. Equipped with 6 feet of rubber covered electric cable provided with a covered switch. Body of cleaner finished in olive green lacquer—other parts are highly polished aluminum.



JANITOR'S HEAVY-DUTY DUST PAN

The famous No. 2-JD Janitor's Heavy-Duty Dust Pan. Made from heavy 20 gauge steel designed to meet the requirements of institutions and industrial users. Pan is equipped with combination handle and floor rest that holds pan in position. Size—12 in. wide, 9 in. deep—nearly 2 in. high at back. Finished in durable black enamel.



ECONOMY TOWEL FIXTURE

Constructed of grey iron and finished with olive green wrinkle finish. Automatic in operation, as the spindle is spring controlled and can make only one revolution, after which the paper must be torn off and it returns to its original position. Paper is also locked on the fixture until all is used and the core destroyed.

DC LIQUID SOAP DISPENSER

(metal, chrome plated)



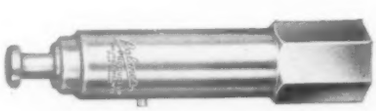
Easily the best appearing and most mechanically perfect of any low priced push-up dispenser.
BRACKET—made from a die casting copper plated, then nickel plated and finally chromium plated.
VALVE—is famous Palmer Neoprene contact valve—acid and alkali proof—spring controlled to prevent leakage.
BOWL—is crystal glass decagon bowl, loose or cemented to bracket with black enameled screw cap.

PC-1 LIQUID SOAP DISPENSER



The PC-1 Soap Dispenser is similar in design to the DC, only the bracket is made from heavy gleaming porcelain that remains beautiful always. It is equipped with the same valve as used in the DC dispenser and is furnished with the same bowl and cap.

HORIZONTAL VALVE



The Horizontal Valve for pipe line soap systems is very compact and neat in appearance—chromium plated finish. All parts of valve subject to corrosion are manufactured from stainless steel or plated for protection. Parts are precision made and entire valve constructed to render long service.

NO-WASTE TOILET PAPER FIXTURE



The No-Waste needs no introduction. It is one of Palmer's most popular fixtures, in use throughout the world. The No-Waste is a permanent fixture that makes real saving possible in serving paper from standard rolls. It delivers a measured amount, regulated by a positive stop, then returned to starting position. Roll is automatically locked on detachable spindle. Simple in design, and constructed of grey iron with olive green wrinkle finish. It will withstand abnormal abuse without failure.

OVAL TOILET PAPER FIXTURE



The Oval Toilet Fixture is designed for notched oval toilet tissue. It is constructed of durable grey iron finished with olive green wrinkle finish—very attractive in appearance. The roll of paper is locked on the fixture until all is used and the core destroyed.

U. S. SANITARY SPECIALTIES CORPORATION

407 S. Western Avenue, Chicago 12, Illinois — 57 East Twelfth Street, New York 3, N. Y.

Soaps—Dispensers—Disinfectants — Floor Treatments—Insecticides

Soaperior GRAVITY TANK LIQUID SOAP SYSTEMS



Porcelain Tank No. 203

—used with Soaperior Gravity-feed Dispensing Systems. This one central reservoir supplies soap for one entire system. One tank supplies any number of valve outlets. Heavy gauge metal. Porcelain enamel inside and out. Other styles on application.

Soaperior Cocoanut Oil Blend Liquid Toilet Soap

Produces a rich lather that cleans perfectly. Leaves hands ideally soft and smooth with lingering, pleasing odor of freshness. Kind to tender skins of girls and small children. Perfect for wash-basin or shower use. Available as concentrate, or in form ready-to-use.

Grimeter Powdered Toilet Soap for Machine Shop and Forge

A blend of fine toilet soap, lanolin and vegetable meal. Cleans in a flash, yet without scraping. Leaves hands soft and smooth.



Soaperior Valves and Dispensers

Soaperior Gravity Liquid Soap Dispensing Systems function perfectly in heaviest traffic washrooms. Installed with pipe exposed or concealed. Ideal for showers. Valves are practically indestructible. A ready supply of soap at each valve! Most economical—dispenses liquid soap for approximately 4,000 hand washes per gallon. Send wash-room layout for system estimate.



No. 149—Dispenses Lather
No. 159—Dispenses Liquid Soap

Used at wash basins located singly, in showers, or where maximum abuse is the rule. Porcelain enamel inside and out. Concealed wall fastener. Locking cap. Capacity—full quart.



No. 141—Dispenses Lather
No. 151—Dispenses Liquid Soap

Modern one-piece bracket, chromium base with durable glass or metal globe. Concealed wall fastener. Measured portion of soap dispensed per stroke. Capacity—pint.



No. 800—Liquid Soap Dispenser

Black plastic base design is engineered and specially ribbed to stand maximum abuse. Heavy glass globe. Easy to install. Low cost. Capacity—14 oz.

DISINFECTANTS

Clenopine — Disinfectant - cleaner, cleans toilet room floors, closet seats. Disinfects and deodorizes while it cleans. Costs no more than plain soap. Four times stronger a germicide than carbolic acid yet harmless to hands and to surfaces. Leaves mild aromatic pine fragrance.

Formula 7 — Liquid toilet bowl cleaner. Quickly dissolves and removes organic stains and encrustations that defy ordinary cleaners. Saves much labor.

SANITARY NAPKINS AND VENDERS

Kumfie—No. 1005 moisture-proof, fully absorbent napkins. Packed two napkins per carton and vends for five cents. Revenue derived covers cost of service.

Useptican — Disposal receptacle. Conveniently mounted on closet partition. Contents removed in liner bag without handling.

POLISHES AND CLEANERS

Gleme—A fine cream polish. Polishes quickly and dries hard. For furniture, pianos and high finished woodwork. Concentrated.

Shynebryte — Polishes brass, copper, silver, chromium, nickel and bronze. Non-explosive.

Soaperfect—Enamel and porcelain cleaner. Excellent for polishing nickel, chromium and copper.

FLOOR MAINTENANCE

Tileze "XX" Floor Cleaner—a soap and solvent cleaner. For floors—walls — woodwork. Easiest application possible. Applied with sprayer. Heavy concentration provides low cost in use.

Luster-bryte—Non-buffing wax. A tough resilient wax floor coating. Less slippery than untreated floors. Bears Underwriters' Laboratories approval as anti-slip material.

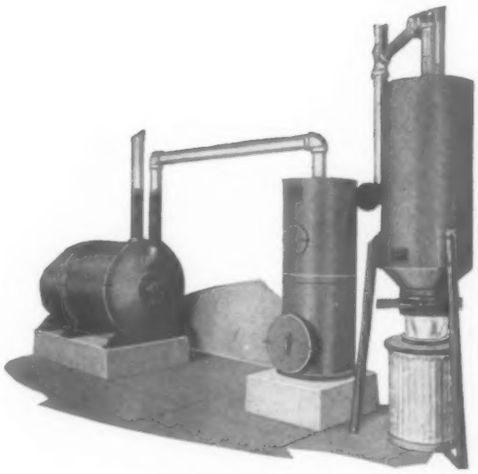
Preservaseal penetrating *sealer*—For wood and concrete—Excellent for classroom floor treatment. Bears approval best flooring manufacturers.

Trazo-Seal—a terrazzo floor sealer . . . Simplifies cleaning operations to terrazzo floors by filling cracks, holes, scratches and eroded places.

Tufen-bryte — a gymnasium floor finish. Resists rubber burns. Protects against grease, oil or moisture penetration. Tough!

THE SPENCER TURBINE COMPANY

Hartford 6, Connecticut



THE SPENCER CENTRAL VACUUM CLEANING SYSTEM

The Spencer Central Vacuum Cleaning System has met with the approval of architects and engineers everywhere, and has been installed in more than 10,000 buildings, including more than 1500 school buildings.

Spencer Central Vacuum Cleaning is a permanently installed system for the speedy and complete removal of dirt and dust from all kinds of floors, walls, ceilings, furniture and other building equipment. It consists of five essential parts, each carefully selected to meet the special requirements for each individual building:

1. A vacuum producer, located in the basement. 2. Inlet valves, conveniently located on all floors and piped to vacuum producer. 3. Specially designed, entirely enclosed, and easily cleaned separator. 4. Light weight, flexible hose. 5. Special vacuum tools for each operation.

Advantages—In exhaustive tests in leading schools, the powerful vacuum, scientifically applied with correct tools, has demonstrated its ability to remove more of the dirt in less time than other methods.

Because the equipment is simple in design, requiring little attention and because these systems are built to provide satisfactory service over long terms of years, both the operating and amortization costs are extremely low.

One janitor can clean twelve average sized class rooms in two hours with a 3 HP Spencer System. The Spencer elbow joint makes cleaning around furniture easy.

For Cleaning Erasers and Chalk Trays—Spencer Vacuum Cleaning, instead of scattering the great bulk of the chalk dust on the floor, provides a method of cleaning erasers and chalk trays that is rapid, sanitary, easy and thorough. The janitor has only to attach a special tool and move it across the surface of eraser or chalk tray.

Swimming Pool Cleaning Equipment—By means of special cleaning tools usually employed in connection with the pump on the filtering system, it is possible to remove accumulated sediment from swimming pools without the waste of water involved in draining the pool. Bulletin on request.

In Boiler Rooms—Spencer Vacuum keeps boilers working at top efficiency by cleaning soot out of boiler tubes, in this way often saving the cost of the entire installation within a few years. Spencer Vacuum also keeps boiler room floors clean, and easily removes soot and dust from overhead pipes.



SPENCER PORTABLE VACUUM CLEANERS

The Spencer ⅓ HP Portable Vacuum Cleaner weighs only 34 pounds. The Spencer ¾ HP unit shown below weighs 150 pounds. Both are built on the same principles of design as the larger Spencer units, and use the same vacuum tools. Easy to clean, easy to use, and built for long life service.



ALLAN J. COLEMAN

120 W. Illinois St., Chicago, Ill.

COLEMAN'S SEWER and DRAIN CLEANING TOOLS



FLAT STEEL SEWER RODS

And Tools for Opening All Stoppages

All Rods are made of a special prepared Oil Tempered Spring Steel Wire and are fully equipped with Spear Point, Handle and Roller Ball.

FLEXIBLE COIL WIRE SEWER AND PIPE AUGERS

Made of the best Oil Tempered Spring Steel and are flexible, enabling them to turn bends and go through traps. Furnished with corkscrew and handle complete.



FLEXIBLE REVOLVING SOLID ROLLER BALL HEAD FOR SEWER RODS



Equipped with 6 inch Flexible Spring Attachment which enables Rod to be rolled around any bend.

GIANT REVOLVING SEWER CLEANING SPEAR POINTS AND ROOT CUTTERS FOR SEWER RODS



Points revolve by pushing in and out of pipe. Will drill a hole through most any stoppage.

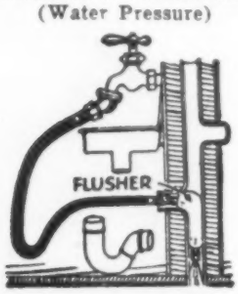
REVOLVING SOLID ROLLER BALL HEAD FOR SEWER RODS



This Ball Head is furnished with a solid shank to bolt onto Rods.

HYDRAULIC FLUSHER

(Water Pressure)



This **Hydraulic Flusher** is made of several plies of water-tight heavy rubberized fabric, which assures a strong, durable and flexible connection that is easy to insert into traps, vents, curved sewer drains or pipes.

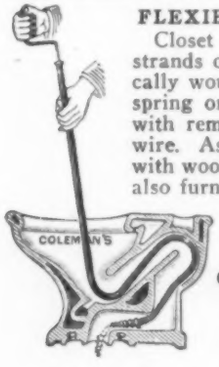
HEADQUARTERS for all kinds of Flexible Sewer and Pipe Augers—Flat Steel Sewer Rods—Flexible Closet Cleaners—Wood Conduit and Sewer Rods—Basin Dips—Brass Suction and Force Pump—Suction and Force Cups—Hydraulic Flushers—Gauge Glass Cutters—Strap Wrenches—All articles can be purchased through your local Supply Jobber

LEAD JOINT RUNNERS



Our **Lead Joint Runners** are made to handle various sizes of asbestos rope which is furnished with clamp. Clamp is wrought steel formed with pouring funnel enabling hot lead to flow quickly to joint without waste.

FLEXIBLE CLOSET CLEANER



Closet Cleaners are made of 21 strands of high grade wire scientifically wound to form a solid flexible spring or shaft ⅜" O.D. Equipped with removable corkscrew and cone wire. Assembled with polished tube with wood grip handle. Other grades also furnished.

CAN ALSO FURNISH CABLES FOR SEWER MACHINE

SEND FOR OUR CATALOG



Suction Pump

SUCTION PUMP

Has suction of 50 lbs. and a force of 100 lbs. or more. Equipped with large reversible red rubber cup, with cast brass screw connections.

FORCE CUP

Made of special grade large 5½" Red Gum cup. Corrugations on bottom give perfect seal.



Force Cup



GAUGE GLASS CUTTER

Cadmium plated overall . . . with wood finished handle. Sizes made to cut from 8" to 30" lengths, inclusive.

"GUARD HEALTH" By Using COLEMAN'S Tools to Keep Sewer Drains Running Freely and Have Sanitary Buildings

J. A. SEXAUER MANUFACTURING CO., INC.

Dept. Y—2503-5 Third Avenue, New York 51, N. Y.

SPECIALISTS IN PLUMBING AND HEATING MAINTENANCE MATERIALS FOR 25 YEARS

Today—leading maintenance engineers everywhere have standardized on 'SEXAUER' patented Precision Tools and Triple-Wear Replacement Parts —as advertised in THE SATURDAY EVENING POST

LEAKY FAUCETS BOOST FUEL AND WATER BILLS



STOP THIS WASTE THE 'SEXAUER' WAY

One 1/32" leak in a hot water faucet wastes 76,000 gallons yearly, worth $10.13 at $1 per M cubic feet and costing from $27 to $50 for the fuel to heat it. Multiplied by many faulty fixtures and connections, this loss soon reaches staggering proportions.

'SEXAUER' METHODS STOP LEAKS



that soon ruin costly fixtures. This patented Precision Tool re-forms rough, raised, washer-chewing faucet and valve seats *better than new* to a smooth, round, corrosion-resisting surface, first step in a repair technique now popular with maintenance men everywhere.

"EASY-TITE" 300° F. FAUCET CUSHIONS,



follow-up to the seat reforming operation, outlast ordinary washers 6-to-1. "Easy-Tites" resist absorption, won't split or mush out of shape. They are built of easy-closing DUPONT NEOPRENE that withstands extreme high temperatures—and fabric-reinforced like a tire. Other 'Sexauer' packings complete restoration of fixtures to long and useful service.

"MULE-KICK" CLEANERS —favorites for 25 years—



cost less because they go farther.

"Mule-Kick" Waste Pipe Cleaner prevents clogs, keeps drains free-flowing, sanitary. Safe to use—no choking or dangerous fumes.

"Mule-Kick" Closet Bowl Cleaner purges, deodorizes, restores glisten without rubbing or scrubbing.

"Mule-Kick" Creme Porcelain Polish wipes away stains, makes sinks, refrigerators, tile, metal, woodwork gleam like new. All three "Mule-Kick" products have full, protected strength.





OVER 2,000 'SEXAUER' TRIPLE-WEAR REPLACEMENT PARTS and patented Precision Tools are geared to the need for lasting repairs and long-run maintenance economies. They're listed and illustrated in the big, new, 102-page 'Sexauer' catalog. Your FREE copy is waiting.

A NEARBY 'SEXAUER' TECHNICIAN *will gladly consult with you on plumbing-heating upkeep problems. He'll survey your installation, if you wish, suggest economical, balanced stocks, whatever the age or style of your fixtures. No obligation. A postcard will bring him—and your free 'Sexauer' catalog—promptly. Write today.*

PITTSBURGH PLATE GLASS COMPANY

COLUMBIA CHEMICAL DIVISION

Fifth Avenue at Bellefield, Pittsburgh 13, Pa.

Chicago • Boston • St. Louis • Pittsburgh • New York • Cincinnati • Cleveland • Philadelphia • Minneapolis • Charlotte • San Francisco

COLUMBIA CHEMICALS

for Sanitation and Other Essentials

PITTCHLOR

The easy way to put Chlorine to work as a Germicide, Disinfectant, Deodorant and Bleach

Pittchlor is a high test Calcium Hypochlorite containing a minimum of 70% available Chlorine. Granular in form, it is dry, white and practically dustless. Pittchlor is easily handled—flows freely from convenient sized tins or drums—and requires no expensive equipment installations. Stock solutions can be prepared quickly and easily. Schools will find Pittchlor especially effective and economical to use for these purposes:



SWIMMING POOLS—For purifying the water and cleaning the pools.

LOCKER ROOMS, SHOWERS, TOILETS—For disinfecting and deodorizing . . . for spraying floors and providing foot baths to combat Athlete's Foot.

FOOD PREPARATION AND SERVING AREAS—For prevention of food contamination. Kills bacteria on equipment used in food preparation including coolers, bottles, pasteurizers, separators, silverware, etc.

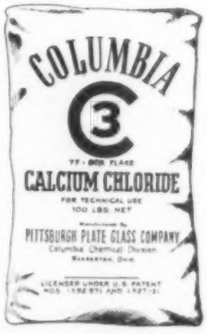
LAUNDRY BLEACH—For precision bleaching to sparkling whiteness and minimum tensile strength losses.

PACKAGING—Supplied in convenient 5 lb. re-sealable cans and 3¾ lb. cans. Also furnished in 100 lb. drums.

COLUMBIA CALCIUM CHLORIDE

Summer Dust Control, Winter Ice Protection

IN SUMMER—Columbia Calcium Chloride eliminates dust and maintains firm surfaces on dirt walks, roads, driveways, playgrounds, tennis courts, athletic fields and other large areas. Unhealthy dust is not permitted to form because Columbia Calcium Chloride absorbs moisture from the air and binds the tiny dirt particles into firm, safe, dust-free surfaces.



IN WINTER—Columbia Calcium Chloride applied to steps, walks, roads or driveways melts ice and makes them easy to clean. When mixed with sand or cinders, it enables abrasives to become partially embedded and forms a firm, non-skid surface. Abrasives thus treated last longer—don't blow away—require lighter and fewer applications.

Treatments may be made manually for small areas; mechanical methods for spreading are available for larger ones. At all times, Columbia Calcium Chloride is easy and economical to use—actually effecting savings through accident and dust prevention, and surface consolidation.

OTHER COLUMBIA CHEMICALS

CLEANER AND CLEANSER—In white powder form, specially prepared for general use in all manual cleaning operations—china and glassware, kitchen equipment, etc. Contains no harmful inactive ingredients; dissolves in water rapidly and completely.

COLUMBIA DETERGENT—A carefully blended mixture of the scouring type. Especially suitable for cleaning large areas, such as enameled and painted surfaces, tile and marble walls and floors. Will not scratch or otherwise harm these surfaces.

COMPLETE INFORMATION ON REQUEST—Literature containing more complete description will be furnished on request, together with prices and the name of your nearest distributor.

SOLVAY SALES CORPORATION

Alkalies and Chemical Products Manufactured by The Solvay Process Company

40 Rector Street, New York 6, N. Y.

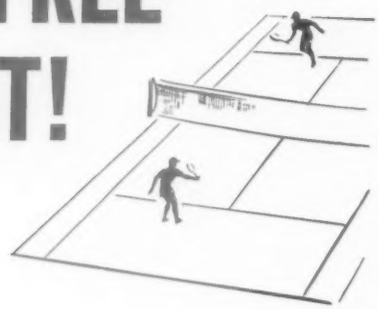
BRANCH SALES OFFICES:

BOSTON • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DETROIT
NEW ORLEANS • NEW YORK • PHILADELPHIA • PITTSBURGH • ST. LOUIS • SYRACUSE

HERE'S EASY WAY TO KEEP ATHLETIC FIELDS DUST-FREE ...AT LOW COST!









Faced with less man power? Short on equipment? SOLVAY Calcium Chloride can provide the answer to keeping your athletic fields clean, compact and dustless.

Simply apply this material on cinders, clay, bluestone, earth, gravel. *It completely ends dust.* SOLVAY Calcium Chloride can be applied by anyone—no experience or special equipment is necessary. This treatment is clean, odorless, colorless and non-staining. *Economical* too . . . cost averages only 3¢ to 4¢ per square yard per season!

For over 25 years leading schools and universities have ended dust on tennis courts, baseball diamonds, athletic fields and children's playgrounds with SOLVAY Calcium Chloride. Also eliminates weeds and makes for easier care in upkeep.

USED FOR OVER 25 YEARS

For Cleaner, Weedless Dust-free Play Areas, Use

SOLVAY CALCIUM CHLORIDE

WRITE FOR FREE FOLDER TODAY! No charge or obligation. Write to SOLVAY SALES CORPORATION, 40 Rector Street, New York 6, N. Y., or use the postage paid American School and University postcard in the back of this book.

STUMPP & WALTER CO.

Seeds — Bulbs — Plants — Equipment and Supplies

132–138 Church Street, New York 8, N. Y.

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WHITE PLAINS, N. Y.
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BRANCH STORES in:
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NEW 32-PAGE BOOKLET

LAWN QUIZ

Interesting — Informative

Hundreds of questions about Lawns. How to make them. How to renovate them. How to feed, mow and care for them generally. The many uses to which you can put your Lawn.

Answers are by experts

The cost is 25 cents, but we mail it free on request with orders of $5 or over, received before June 1.

GRASS SEED OF KNOWN QUALITY

FOR GOLF COURSES, TENNIS COURTS, POLO FIELDS, ATHLETIC FIELDS, AIRPORTS, CAMPUS, LAWNS, ETC.

All our seeds are of the highest quality, botanically true to name and are cleaned and re-cleaned, special care being given to the elimination of weed seeds.

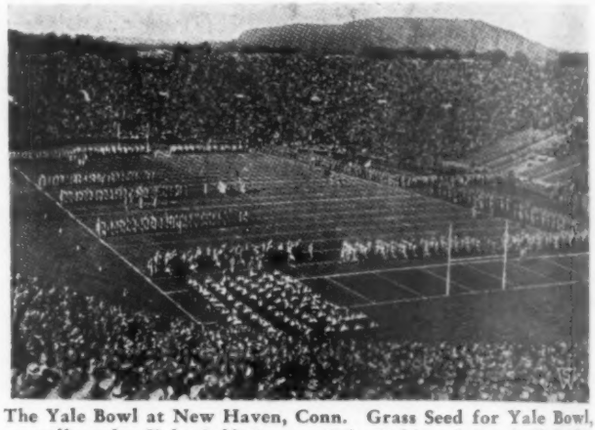
We are always glad to advise in regard to formulas suited to soil and climatic conditions, treatment of soil, fertilizing, etc.

EQUIPMENT AND SUPPLIES

We are also agents and dealers in Tractors, Mowers, Rotary Soil Screens, Implements, Fertilizers, Insecticides and Sundry Equipment and Supplies.

Most of these items will be available during 1946, and we welcome your inquiries.

Complete Catalog on Request



The Yale Bowl at New Haven, Conn. Grass Seed for Yale Bowl, as well as for Yale Golf Course, Polo Field and Football Field, also for Stadium at West Point, supplied by the Stumpp & Walter Co.

HIGH QUALITY BULBS

We are one of the largest growers and importers of Bulbs for discriminating flower lovers in the United States.

FLOWER SEEDS

All our seeds are of the highest quality and are carefully examined and tested at our trial grounds. We offer only those of superior strains and finest types, and a complete list of new introductions.

VEGETABLE SEEDS

All our seeds are of the highest quality and we list only such sorts which from tests at our trial grounds we have found to be of superior merit and which we can recommend for both the market and home garden.

132 Page 1946 Seed Annual Free on Request



Experimental Turf Plots at the Stumpp & Walter Company's testing grounds at Farmingdale, Long Island. Here research work has been carried out with grass varieties, plant foods, mowers and rollers

IMPORTANT FOR 1946!

SAWCO-JAPY

(Japanese Beetle Milky Disease Spore Dust)

Destroys the larvae or grub of the Japanese Beetle which causes severe injury to turf in lawns, golf courses, parks, pastures and gardens.

The bacteria causing the "milky disease" are Bacillus Popillee and Lentimorbus. Sawco-Japy (milky disease spore dust) contains at least 100 million viable spores of either or both of the above organisms per gram of product. $5.00 per lb.

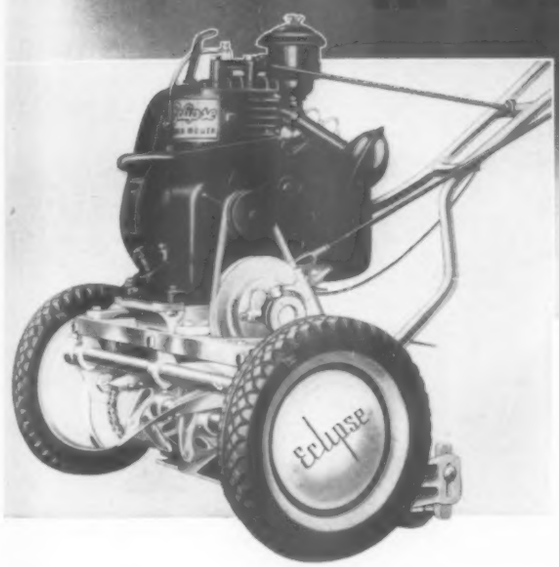
TUFOR SELECTIVE WEED KILLER

Tufor kills broad leaf weeds without causing injury to most desirable grasses. Tufor is an improved formulation of 2, 4-D, weed killing chemical. Use 1½ qts. per 100 gals. of water. Use 100-200 gals. of solution per acre. Qt., $3.50. Gal., $11. 5 gals., $40.00.

THE ECLIPSE LAWN MOWER COMPANY

Factory and General Offices: Prophetstown, Illinois

THOUSANDS UPON THOUSANDS IN USE



Eclipse

THE WORLD'S BEST LAWN MOWER

Here are the history-makers for 1946 in lawn mowers. They're made of the better and stronger steels developed during the past 4 years. They enjoy all the benefits of vastly finer materials throughout... advanced craftsmanship that sets new standards in the industry... scientific improvements and engineering features that challenge duplication in the most minute degree.

ECLIPSE ROCKET... 20" Power Lawn Mower... meets the most exacting requirements by its carefree maintenance and perfect performance... perfect shearing with heavy-duty reel and oil-tempered lower knife with raised lip and skid for turf protection... sharpening feature optional—convenience and economical... maximum efficiency ... simplicity itself in handling... and life-long performance that multiplies over and over again the economy of the initial low price.



ECLIPSE SPEEDWAY... Cuts a 32" swath 150 feet long every 15 seconds by actual stop watch timing, with positive operation control. It's the world's fastest lawn mower and the prize-winning value in its field. In these days of labor shortages, think of what it means to cut twice the acreage in half the time. Consider the countless extra years of perfect service built into this mower, and its low cost in purchase and in operation becomes even more pronounced.

ECLIPSE MODEL L... 5-Blade... finger-tip adjustment, automatic sharpening, natural grip all-steel handle... are only some of the many exclusive features to be had in this hand mower masterpiece. Professional cutting results every time and unbelievably long years of added service explain why one owner after another goes out of his way to recommend it.

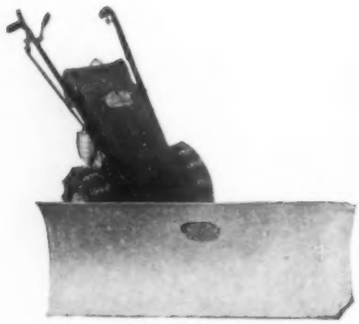


4-YEAR BACKLOG

There will be a shortage of these fine mowers this year for that reason, so orders will be filled in the order in which they are placed. If you need one of these mowers, place your order at once...and take delivery at the earliest possible date. Considering the reputation of Eclipse Lawn Mowers for outstanding quality... plus the great scientific, engineering and construction advances incorporated into every 1946 model... any delay in getting your Eclipse is a negligible factor and becomes of secondary importance. You may be certain that every effort will be made to fill your order as soon as it is humanly possible to do so, so place your order immediately.

GRAVELY MANUFACTURING COMPANY

Box 252, Dunbar, W. Va.



Model L GRAVELY with Vee-Type Snow Plow

Schools and universities throughout the country recognize the distinct advantages of the GRAVELY—the **only** machine that solves so many upkeep problems.

1. **Mows Your Lawn**
2. **Cuts Tall Weeds and Grass**
3. **Removes Snow**



Model L GRAVELY with 75" Gang Mowers

A YEAR-ROUND MACHINE

You buy ONE sturdy 5 H. P. Tractor . . then, change **power** attachments according to the job. With the GRAVELY **one** man does everything. . . .

A 30-inch Power Driven Rotary Mower for the lawns (power-driven gang units and riding sulky available for the larger areas) . . . a Power Sickle Mower for the rough spots and athletic fields. . . . A power sprayer . . . A Power Pump . . . A cart for moving dirt . . . or odd jobs of hauling. . . . Both Vee and a Patented Reversible Blade Type Snow Plow capable of working in 12" of snow. Whatever the job, if you own a GRAVELY you have the equipment and sufficient power to do it.



FRUITS OF SPECIALIZATION

The GRAVELY is produced in a factory devoted to manufacturing nothing else. This includes making the motor as well. Each manufacturing operation is controlled. This means that each machine is produced as a complete unit, each part **designed** to be used with the others . . . not an **assembling proposition.**

The GRAVELY products are sold and serviced through Dealers, for all GRAVELY Dealers are qualified to render service on the machines they sell. Write us that you may check with our representative in your neighborhood. Like the product, you will find our sales policy practical . . . you are not asked to buy a machine without first being shown what it will do,—under your very own conditions.

EXCLUSIVE GRAVELY FEATURES

There is a 5 H. P. motor . . . **two** forward and reverse speeds . . . an automotive type differential . . . a worm gear drive running in oil . . . one spot lubrication system for both tractor and motor . . . NO CHAINS . . . an oil bath air cleaner . . . an oil filter to clean and strain the oil . . . a SAFETY SLIP CLUTCH individually incorporated into each power attachment . . . and many, many others.

Learn more about a machine that for TWENTY years has been improving the appearance of schools and universities and at the same time reducing upkeep costs.



Model L GRAVELY with 30" Rotary Mower

Ask for our catalog entitled:

"MAKING AND KEEPING A BEAUTIFUL LAWN"



Model L GRAVELY with 42" Sickle Mower

PIONEER GEN-E-MOTOR CORPORATION

5841 Dickens Ave. (Dept. AS-46), Chicago 39, Ill.

EXFORT OFFICE: 25 Warren Street, New York 7, U. S. A. Cable: "SIMONTRICE," U. S. A.

PINCOR! MORE MOWER VALUE PER DOLLAR

The new (and thoroughly pre-tested) PINCOR mowers have many exclusive features. They're lighter weight for easier handling; have all-steel, welded construction for extra rigidity; one-piece, exchangeable, cutting units; built-in sharpeners; sealed-in lubrication; instantly adjustable cutting height from ½" to 2½"—and this is a real advantage for park and other large-area mowing.



● HAND MODELS

Tops in easy operation, quiet performance. They're all steel, lightweight, precision built in every detail for dependable service.



● POWER MOWER

Built for rugged use. Exceptionally easy to operate and to handle because it weighs only 117 pounds. Extra powered for hours of constant service. 1½ H.P. motor, 20-inch cut.

● PORTABLE POWER PLANT

Blue Diamond Pincor Model BLA-6ND power plant. Generates 500 watt 115 volt AC and 100 watt 6 volt DC current. A portable source of electric service for operation of the Hedge Trimmer, portable tools and as a battery charger.



● ELECTRIC HEDGE TRIMMER

Saves hours of time trimming hedges and shrubbery. Hi-cut adapter for high, hard - to - reach shrubbery. Built for rugged use, long wear and trouble-free service.



SEE YOUR DEALER OR WRITE FOR ILLUSTRATED LITERATURE

JACOBSEN MANUFACTURING COMPANY

Racine, Wisconsin

SUBSIDIARIES
WORTHINGTON MOWER COMPANY — STROUDSBURG, PA.
JOHNSTON LAWN MOWER CORPORATION — OTTUMWA, IOWA



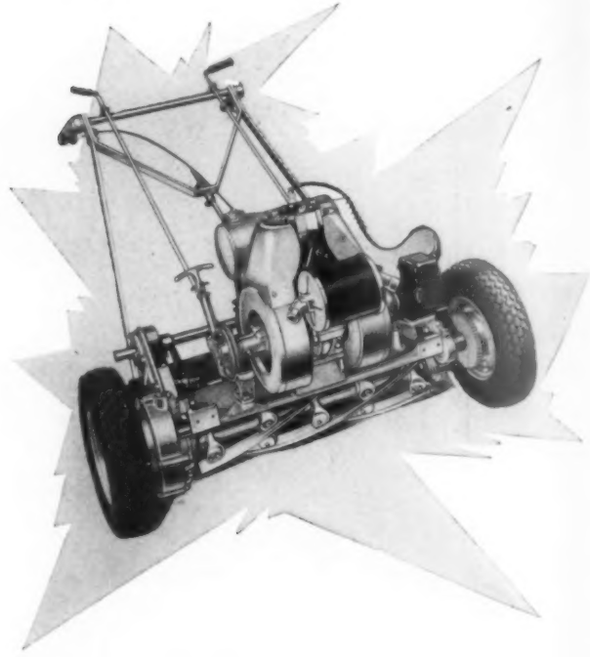
The name Jacobsen is synonymous with finest quality grass-cutting equipment. There's a right size and type mower for every lawn—for maintenance of park systems, cemeteries, public institution grounds, golf courses and other large areas.

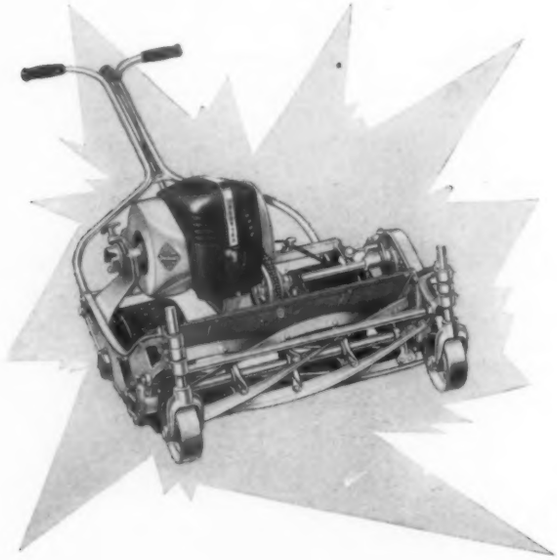
⬅ LAWN QUEEN

Thrifty performance, operating ease, and matchless dependability are built into the Jacobsen Lawn Queen. Its powerful engine guarantees abundant power on slopes, terraces, and wide expanses of long, tough grass. The cutting unit and sturdy chassis are precision built to resist wear and strain. Excellent for school ground use, the Lawn Queen will give years of smooth, easy, economical performance.

4 ACRE HEAVY DUTY MOWER ➡

Versatile and adaptable the 4 Acre Heavy Duty Mower is ideal for open or congested areas, for level ground or slopes. Its heavy duty engine delivers ample power for riding sulky attachment; operator merely guides the machine as he rides . . . a saving in time and labor. Vital driving gears run in an oil bath enclosed in dust-tight housing. This insures dependable performance and reduces repairs to an absolute minimum.





⬅ JACOBSEN ESTATE "24"

The "Estate" is especially designed to do a superior job on the finest lawns. With traction drive behind the cutter, it provides a shorter turning radius and closer cutting between flower beds and shrubbery. This outstanding feature reduces hand trimming . . . saving time and labor. Runs smoothly and efficiently with riding sulky attached. A splendid machine for keeping school lawns in beautiful condition.

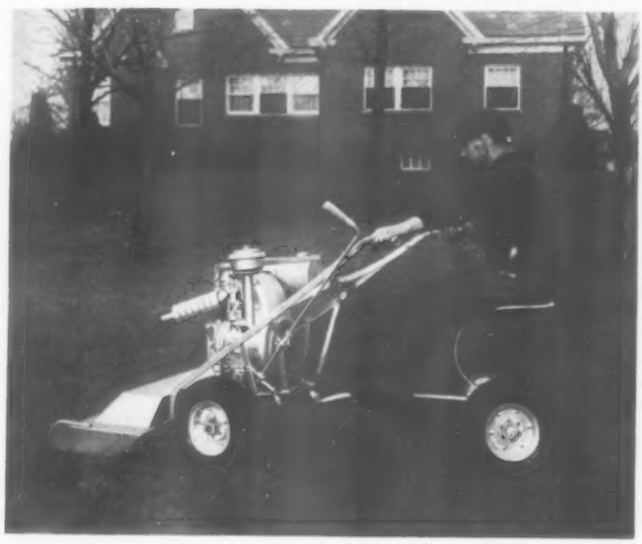
STANDARD MFG. & SALES COMPANY

Lebanon, Indiana

STANDARD POWER MOWERS

Large schools, colleges, parks and estates use STANDARD Power Mowers

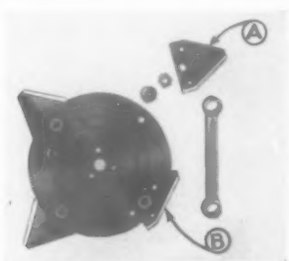
Solve Every Mowing Problem Without Any Attachments



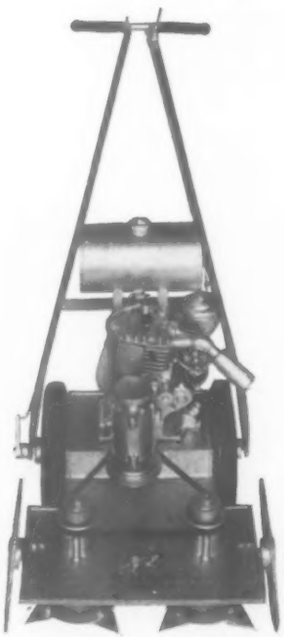
THE STANDARD ROTARY CUTTER

Has been on the market for 14 years, and operated under the hardest kind of service. Used by colleges, parks, schools, large estates, cemeteries, Government facilities, etc. Some individual users have as many as 24 of these mowers in use and are still replacing other mowing equipment with Standard Mowers. Standard Power mower has been developed into the most versatile cutting device in the field — cutting lawn-grass, dandelion, buck-horn, Johnson grass or any other standing growth without cumbersome attachments. It will cut evenly at any height; permits high mowing.

Model	Width of Cut	H.P.	No. Cutters	Capacity
Model 1	25 inches	3	2	5- 6 Acres
Model 2	30 inches	3	2	6- 7 Acres
Model 3	37 inches	6	3	7- 8 Acres
Model 4	48 inches	6	4	9-10 Acres
Model 5	62 inches	7	4	10-12 Acres



Standard Cutter Disc Assembly
Your attention is directed particularly to Standard's unique disc, secret of the remarkable performance of Standard mowing.



The Poynter Mower for Small Lawns and Trimming
2 Sizes 16 and 20 Inches



Mowing in a Big Way—Two 6-foot Mowers and Trailers



An Answer to Your Snow Problems

ANCHOR POST PRODUCTS, INC.

ANCHOR POST FENCE DIVISION

Complete Line of Fences and Playground Equipment

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ANCHOR FENCES FOR SCHOOLS AND SCHOOL PLAYGROUNDS

The Anchor Post Fence Company has been serving public schools and colleges, municipalities and industrial plants with fencing and playground equipment to suit their various requirements for half a century.

Anchor Chain Link Fences

Makers of America's first chain link fence, the Anchor Post Fence Company today manufactures a complete line, and will be glad to supply any interested school executive or architect with a copy of our Chain Link Fence Catalog containing full information about the four exclusive features which make an Anchor Chain Link Fence exceptionally attractive and durable. **Ask for Catalog No. 110.**



Anchor Drive-Anchorage

Anchor-Weld Iron Fences and Gates

Through the exclusive Anchor-Weld method of construction, the Anchor Post Fence Company is able to manufacture iron fences and gates which equal in appearance many expensive hand-wrought products. Many schools throughout the country are today justly proud of their beautiful Anchor-Weld Ornamental Iron Fences and Gates. Some of these are to be found illustrated in our **Catalog No. 111.**

Anchor's Four Exclusive Features

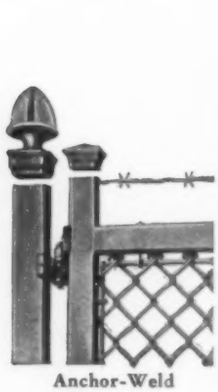
1. **ANCHOR-WELD WIRE GATE**—built with a frame of square tubular steel—arc-welded at the corners. The square shape of the heavy steel tubing, together with the welding of the corners, provides a framework of such exceptional strength that no re-enforcing diagonal braces are needed. We claim that this is the strongest and most attractive wire gate made.

2. **SQUARE TERMINAL POSTS**—stronger because they are square in section. More protective—having no fabric-holding bands and therefore providing no footholds for climbing. Better-looking—because of their graceful lines.

3. **U-BAR LINE POSTS**—made of high carbon steel and U-shaped in section to insure maximum strength.

4. **DRIVE-ANCHORAGE**—grips the soil like the roots of a tree. We have imitated nature's engineering by providing the line posts with a broad foundation. Anchor drive-anchors defy thaws, frosts and the many other strains to which a fence is subjected.

Note: While we strongly advocate the drive-anchor method of setting posts, we can, if desired, set our posts in concrete footings when conditions warrant such a procedure.



Anchor-Weld Wire Gate



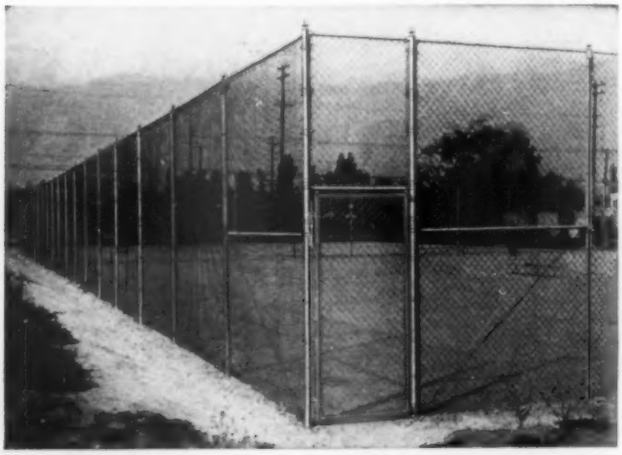
Anchor Chain Link Fence with Top Rail
High School, Mineola, N. Y.



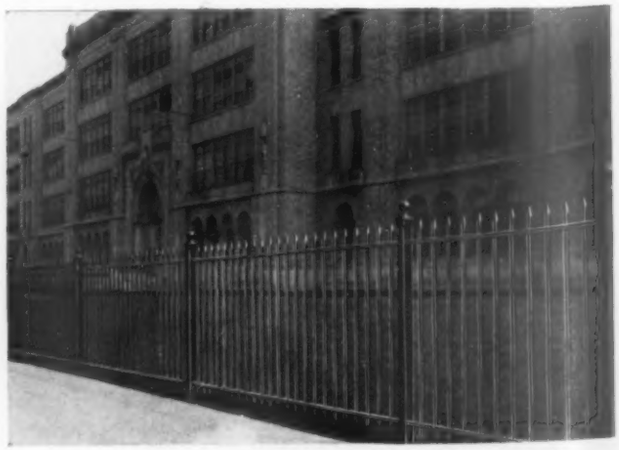
Anchor U-Bar Line Post



Anchor Square Terminal Post



Anchor Chain Link Tennis Court Enclosure at Pasadena High School, Pasadena, Calif.



Anchor-Weld Fence Surrounding St. Anne's School, Fall River, Mass.

CONTINENTAL STEEL CORPORATION

Manufacturers of Chain Link Fence for All Purposes

General Office: Kokomo, Indiana

SALES REPRESENTATIVES IN THE FOLLOWING CITIES

Alexandria, Austin, Atlanta, Canton, Chicago, Columbus, Dallas, Dayton, Des Moines, Detroit, El Paso, Evansville, Ft. Wayne, Grand Rapids, Indianapolis, Kansas City, Louisville, Minneapolis, New Orleans, New York, Norfolk, Oklahoma City, Omaha, Philadelphia, Richmond, San Antonio, South Bend, St. Louis, St. Paul, Toledo, Tulsa, Wichita





COMPLETE CHAIN LINK FENCE

To meet the fencing requirements of schools and universities, Continental has developed a wide range of structural variations in its Chain Link fence. The selection in styles, heights, types of top construction, gates and accessories makes it possible for schoolmen to select the best fence for any installation.

MADE OF KONIK STEEL

FABRIC OF KONIK STEEL

The wire fabric in Continental Chain Link fence is made of KONIK—a new steel containing copper, nickel and chromium for greater strength and rust resistance "clear through." This superior fence fabric carries a zinc coating applied by a special hot dip process to insure uniformity and adhesion of the coating to the base steel. A uniform, bright finish enhances the appearance of Continental fence fabric. Wire is full gauge and woven in exact mesh.

ORDER NOW

TO INSURE EARLIEST DELIVERY

Continental Chain Link Fence has fourteen advanced features of construction. It is designed for the site by competent fence engineers, then factory built for quick erection.

12 STYLES

Continental offers 12 styles of top construction for Chain Link fence. Six popular styles are illustrated to the right. Continental fence is engineered for each specific job.

POSTS AND FITTINGS

Continental fence has heavier, sturdier posts with improved brace construction. Top rails are joined by a special Inside-Outside coupling. Post caps and barbed wire arms are sturdy, heavier. Self-locking slots hold barb wire. New type lock pin eliminates bolts and nuts for fastening fabric to tension bands.

GATES

Strong and easily operated gates and locking devices. Single and double types with improved pivot type hinges. Manually or mechanically operated.

ENGINEERING AND ERECTION SERVICE

Our engineers are prepared to assist you in laying out the most economical installation for your purposes. Trained erection crews are available for correct and economical construction anywhere. When local labor is used Continental will supply competent foreman and inspection service.

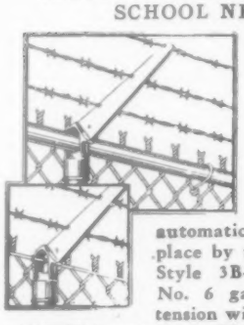
SEND FOR FREE MANUAL



This file size book contains more than 100 illustrations, will help you evaluate fence protection, select right style of fence. Write the

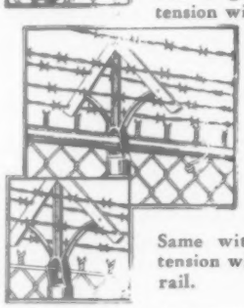
CONTINENTAL STEEL CORPORATION
KOKOMO, INDIANA

A STYLE TO MEET EVERY SCHOOL NEED



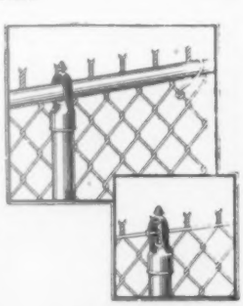
Style 3B - R—Three strands of barb wire with top rail. Arm of 12 gauge pressed steel. Barb wire held in angle slots and automatically locked in place by tension.

Style 3B-W—Same with No. 6 gauge coil spring tension wire instead of top rail.



Style 5B - R—Five strands of barb wire with top rail. Top rail of tubular steel 1⅛" O.D. Has 7" expansion sleeves.

Style 5B - W—Same with No. 6 gauge tension wire instead of top rail.



Style NB - R—No barb wire with top rail.

Style NB-W—Same with No. 6 gauge tension wire instead of top rail.



CONTINENTAL *CHAIN LINK* FENCE

OTHER CONTINENTAL STEEL PRODUCTS >

STEEL ROOFING AND SIDING • FIELD FENCE • GATES • POSTS • BARBED WIRE • NAILS • LAWN FENCE • ETC.

MANUFACTURER'S WIRE • GALVANIZED AND SPECIAL COATED SHEETS • BILLETS • SHEET BARS • WIRE RODS

PITTSBURGH STEEL COMPANY

Grant Building, Pittsburgh 30, Pa.

PITTSBURGH CHAIN LINK FENCE

Better in Every Part

Only Pittsburgh Chain Link Fence has all of the quality features specified here, such as tubular posts and top rail, malleable outside fitted post caps, beveled tension bands, adjustable barbed wire arms, superior gate fittings and genuine copper-bearing steel galvanized after weaving. Quality is insured by Pittsburgh Steel Company's control of every process of manufacture, from ore to the finished fence. You can have this superior complete fence quality at no extra cost.

"Pittsburgh" Products

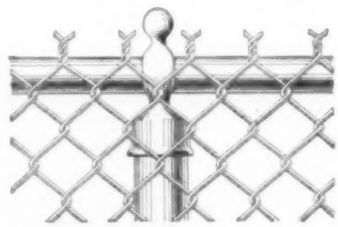
Other Pittsburgh Steel Co. products of interest to School, Municipal and Public Works authorities include Pittsburgh Safety Highway Guard; Wire Reinforcement for pavements, walks and buildings; Pittsburgh Steeltex for Floors, and Pittsburgh Steeltex for Plaster, Partitions, Suspended Ceilings, Stucco and Masonry Veneer; Farm, Poultry, Ornamental Lawn and Special Industrial Fences.

CHAIN LINK FENCE SPECIFICATIONS

Pittsburgh Guardian Chain Link Fence
(Standard Heavy Construction)

Standard height, 6 ft. Built in heights from 5 ft. up to and including 12 ft. In all heights chain link fabric is full height of fence.

Fabric—Pittsburgh Chain Link copper-bearing basic open hearth steel wire, hot galvanized after weaving with heavy zinc coating. No. 6 and No. 9 gauge wire woven in 2-in. mesh. Selvage: both edges have a twisted and barbed finish. Fabric under standard specifications carries a heavy coating of zinc and withstands six one-minute immersions by the Preece Test and meets or betters A.S.T.M. specifications.



12-minute Test Galvanizing—*For the finest quality fence fabric specify Pittsburgh Chain Link Fence with galvanizing which withstands 12 full one-minute immersions by the Preece Test.*

Line Posts—2½-in. o.d. copper-bearing steel pipe, weight 3.652 lb. per ft.; or 2¼-in. H-section, weight 4.10 lb. per foot. Special construction in 5 to 8-ft. high fence, with 2-in. o.d. line posts set 30 in. deep in concrete, is available.

Top Rail—1⅝-in. o.d. copper-bearing steel pipe, weight 2.272 lb. per ft. Top rail may be omitted.

Terminal Posts—End and corner posts 3-in. o.d. copper-bearing steel pipe, weight 5.79 lb. per ft.



Swing Gate Posts—3-in. o.d. copper-bearing steel pipe, weight 5.79 lb. per ft. for single swing gates up to and including 6-ft. opening, and for double swing gates up to and including 12-ft. opening.

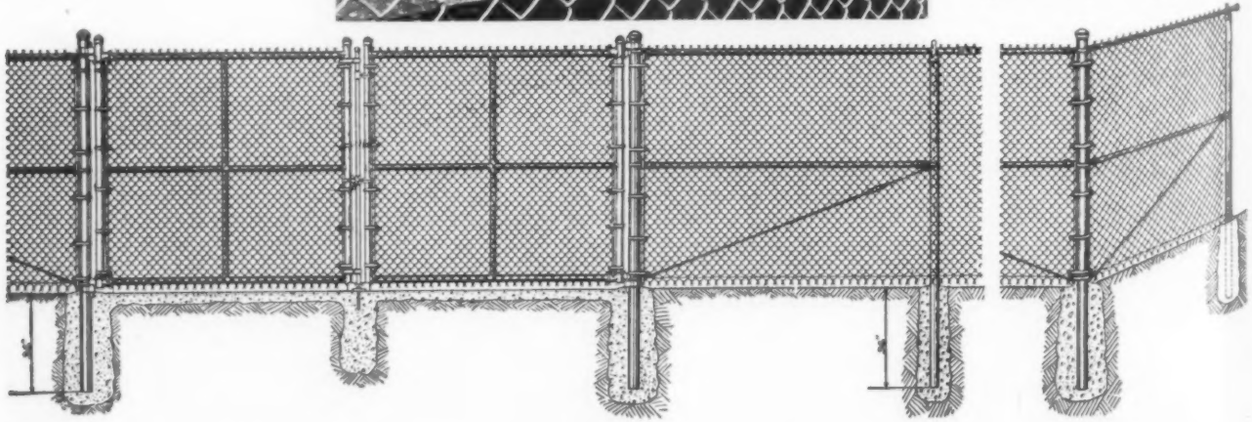
4-in. o.d. copper-bearing steel pipe, weight 9.10 lb. per ft. for single swing gates wider than 6 ft. up to and including 13-ft. opening. Also, for double swing gates wider than 12-ft. opening up to and including 26-ft. opening.

6⅝-in. o.d. copper-bearing steel pipe, weight 18.97 lb. per ft. for single swing gates wider than 13 ft. up to and including 18-ft. opening. Also for double swing gates wider than 26 ft. opening up to and including 36-ft. opening.

8⅝-in. o.d. copper-bearing steel pipe, weight 24.7 lb. per ft. for single swing gates wider than 18-ft. opening, and for double swing gates wider than 36-ft. opening.

Post Spacing and Setting—Posts are regularly spaced in line of fence 10-ft. center-to-center and set 36 in. deep. In all cases posts are set in concrete footings (1:2:4 mix), crowned to shed water and protect post at ground line. Diameters of footings are 12 in. for terminal posts, 10 in. for line posts where fence is 7 ft. and over and 9 in. for line posts where fence is 6 ft. high.

Bracing—End, gate and corner posts are suitably braced with 1⅝-in. o.d. horizontal copper-bearing steel pipe braces.



weight 2.272 lb. per ft., and adjustable truss brace between terminal post and first line post, complete with fittings. Swing gate posts furnished with auxiliary side braces where conditions require. Bracing not furnished on 5-ft. high fence with top rail.

Post Tops—Made of heavily hot zinc coated malleable iron, designed to fit over post top to exclude moisture.

Tension Bars—¾x¼-in. tension bars, secured to terminal post with bands. Hot zinc coated.

Brace and Tension Bands—Made of heavy stampings of the latest approved type, hot zinc coated.

Fabric Bands—No. 6 gauge aluminum alloy of new improved self-tying design, eliminating unsightly buckles.

Gates—Made of 2-in. o.d. hot zinc coated copper-bearing steel pipe, weight 2.717 lb. per ft., with necessary intermediate braces of 1⅝-in. o.d. copper-bearing steel pipe, weight 2.272 lb. per ft. For special construction fence (2-in. o.d. line posts) gate frames used are 1⅝ in. o.d.

Gate Filler—All gates to be filled with fabric to match fence line.

Hinges—Latest type improved heavy duty ball-and-socket design, permitting 180° gate swing, centering gate weight at ground line, eliminating gate sag and preventing turning of hinges on posts.

Latches—Heavy duty plunger-bar clevis type, designed for positive padlock locking.

Ask about Stainless Steel Guardian Fences.

Pittsburgh Custodian Chain Link Fence

(Standard Heavy Construction)

Standard height, 7 ft. over all. Built in heights from 5 ft. up to and including 13 ft. In all heights Chain Link Fabric is 1 ft. less than over-all height of fence.

Construction is the same as Pittsburgh Guardian Chain Link Fence, except that three strands of barbed wire are mounted on adjustable barbed wire arms attached to each line post. Special construction 5 to 8-ft. high fence, with 2-in. o.d. line posts set 30 in. deep in concrete, is available.

Barbed Wire Arms—Made of malleable iron and pressed steel, latest pattern, adjustable. Heavily hot zinc coated. Arms carry three strands of barbed wire—the top strand at an angle of 45°, 12 in. in or out of the fence line; or the arm may be adjusted to vertical position if desired.

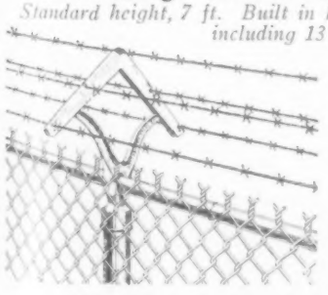


Barbed Wire—Four-point pattern, comprising two strands of No. 12½ gauge copper-bearing wire—heavily hot galvanized, with aluminum alloy barbs spaced 3 in. apart.

Ask about Stainless Steel Custodian Fences

Pittsburgh Chieftain Chain Link Fence

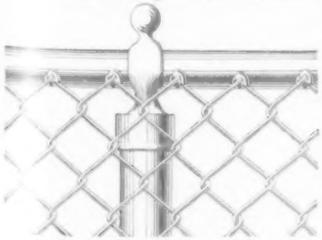
Standard height, 7 ft. Built in heights from 5 ft. up to and including 13 ft. In all heights chain link fabric is 1 ft. less than overall height of fence.



Construction throughout is the same as Pittsburgh Custodian Chain Link Fence, except top finish, which comprises 5 strands of barbed wire and barbed wire extension arms as illustrated here.

Ask about Stainless Steel Chieftain Fences.

Pittsburgh Residential Chain Link Fence



Standard height, 4 ft. Built in heights 3, 3½, and 4 ft. In all heights chain link fabric is full height of fence.

Construction same as Pittsburgh Guardian Chain Link Fence shown on the previous page, with the following exceptions:

Fabric—Pittsburgh Chain Link copper-bearing basic open hearth steel wire, hot galvanized after weaving with heavy zinc coating. Furnished regularly in 2-in. mesh, No. 9 gauge. Also available in No. 6 gauge or No. 11 gauge. Selvage: one edge finished in barbed and twisted, other edge in knuckled finish. Recommended practice is to dress knuckled edge at top of fence just under top rail as illustrated. Fabric carries the full maximum coating of zinc that can be successfully bonded to the specified gauge of wire and meets or betters A.S.T.M. specifications.

Line Posts—2 in. outside diameter steel pipe, copper-bearing, weight 2.717 lb. per ft.

Top Rail—1⅜-in. outside diameter steel pipe, copper-bearing weight 1.678 lb. per ft.

Terminal Posts—End and corner posts 2½-in. outside diameter copper-bearing steel pipe, weight 3.652 lb. per ft.

Gate Posts—2½-in. outside diameter copper-bearing steel pipe, weight 3.652 lb. per ft. No bracing is required because of top rail. If top rail is not used terminal posts are furnished with braces.

Post Setting—Line posts are set 24-in. and terminal posts 30-in. deep in concrete footings (1:2:4 mix), crowned to shed water and protect post at ground line.

Gates—Residential gate frames are made of 1⅝-in. outside diameter copper-bearing steel pipe, weight 2.272 lb. per ft.

Note: Residential fence can be furnished with either lighter or heavier framework. Please write for further information.

Ask about Stainless Steel Residential Fences.

Pittsburgh Chain Link Tennis Court Fence

Heights—8, 10 and 12 ft. in one width of fabric. Heights greater than 12 ft. furnished in two panels.

Fabric—No. 11 gauge, 1¾-in. mesh; selvage knuckled top and bottom.

Posts and Framework—Same as for Guardian Fence.

Gates—Standard Tennis Court Gates are 7-ft. high by 3½-ft. opening (walk); or 10-ft. opening (double drive) with overhead transom. This fence is in every detail, except for the slight difference in mesh and weight of fabric, the equivalent of the Pittsburgh Chain Link Fences previously described.

Note: Tennis Court Fence can be furnished with lighter framework. Please write for further information.



All Pittsburgh Complete Chain Link Fences are designed and manufactured to meet or exceed the most rigid requirements, including A.S.T.M. specifications.

Ask about Stainless Steel Tennis Court Fences.

Miscellaneous Construction

In connection with complete Pittsburgh Chain Link Fences, such items as removable panels for transformer station enclosures; overhead-track slide gates, manually or mechanically operated; baseball backstops and fence end fans are available in standard designs. Special cantilever gates and special construction of all kinds can be supplied on estimate.

Erection Service

An erection service is available everywhere for Pittsburgh Chain Link Fence, either under direction of Pittsburgh Steel Company erection superintendents or the thoroughly experienced crews of our distributors. If you prefer to have your own workmen install the fence, an erection superintendent to direct them will be furnished at a reasonable charge.

Diagram, Prices and Information

When writing for information and prices, may we suggest that you send a diagram of the proposed job. If possible, send blue print with correct measurements and specifications.

Note: All weights and dimensions are nominal and are taken from full standard weight schedule adopted by manufacturers.

Other Pittsburgh Chain Link Fabrics

Pittsburgh Chain Link fabric, made throughout to the high Pittsburgh standards of quality, comes in a wide range of gauges, meshes and fabric widths. Stainless Steel Fences are also available.

Other fabrics for fur farming fences, window guards, partitions, panels, flexible belting, etc., are available—ranging from the heavy fence fabrics to smaller meshes and light gauges for special purposes.

CYCLONE FENCE DIVISION

(American Steel & Wire Company)

UNITED STATES STEEL

General Office: Waukegan, Illinois

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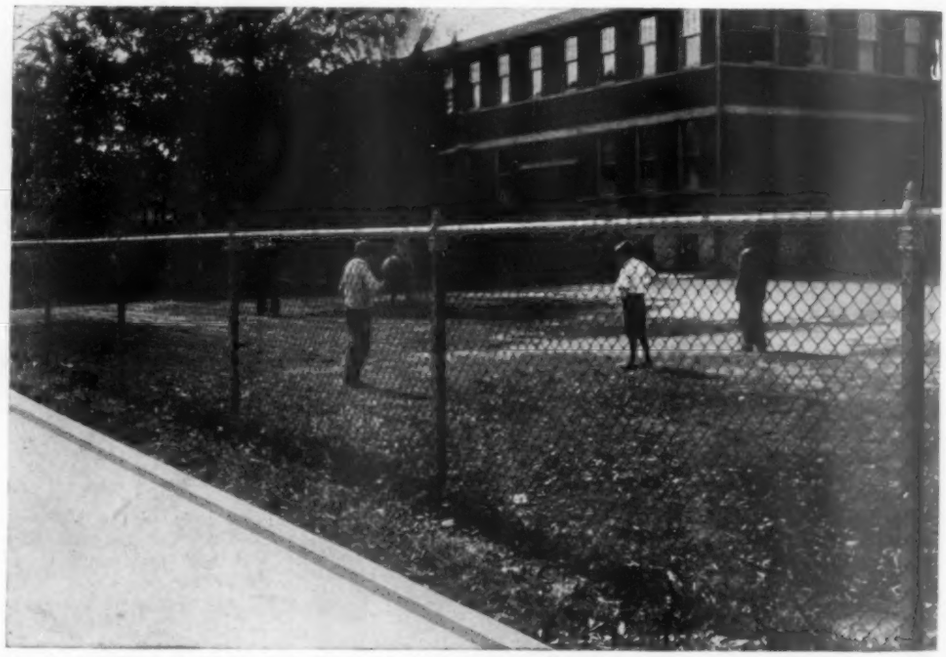
United States Steel Export Company, New York

CYCLONE FENCE is the economical, serviceable enclosure for school yards, playgrounds, athletic fields, outdoor pools. For years Cyclone has specialized in fencing school property. Cyclone Fence is the recognized standard for every school and playground purpose.

School grounds enclosed with U·S·S Cyclone Fence provide maximum protection for your school children.

Athletic fields fenced with Cyclone get more paid admissions—for they permit complete control of crowds, efficient collection of tickets.

Because of its long, trouble-free service, you will find Cyclone Fence most economical in the long run. In every detail it is made for durability and long life.

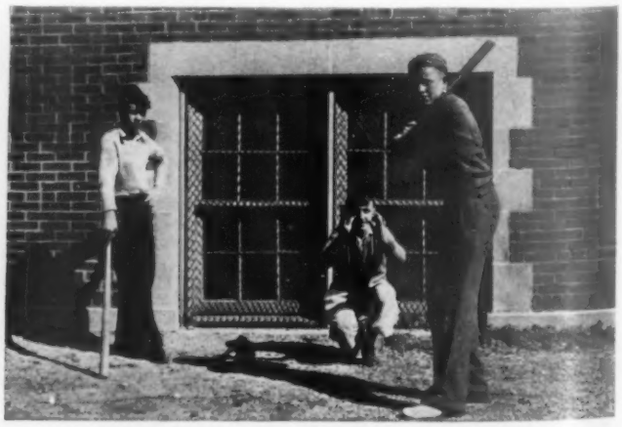


Cyclone Safeguard Chain Link Fence for School Grounds, Playgrounds, Parks, Institutions, Etc.

Get the facts on Cyclone Fence now. Send for our free booklet: "Your Fence—How to Choose It —How to Use It." The 32-page book is packed with information you will want on Cyclone Fence, Tennis Court Enclosures and Window Guards. Ask for a free estimate. *Also ask for copy of useful folder giving detailed specifications for Cyclone Fence and other Wire Products used for School Properties.*



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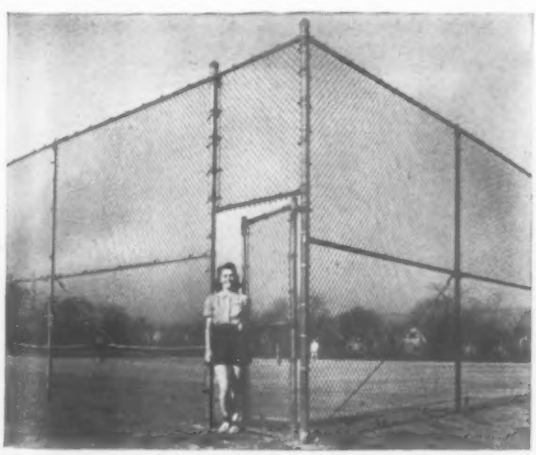
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Style 0TH Chain Link Wire Fence



Style 3TH

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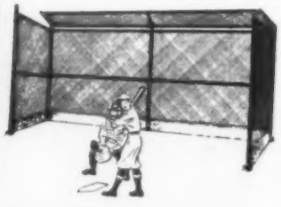
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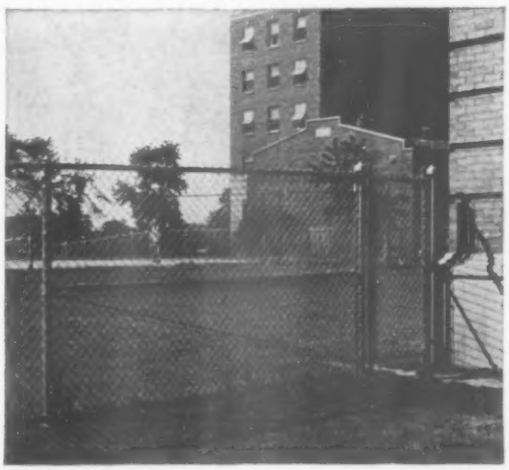
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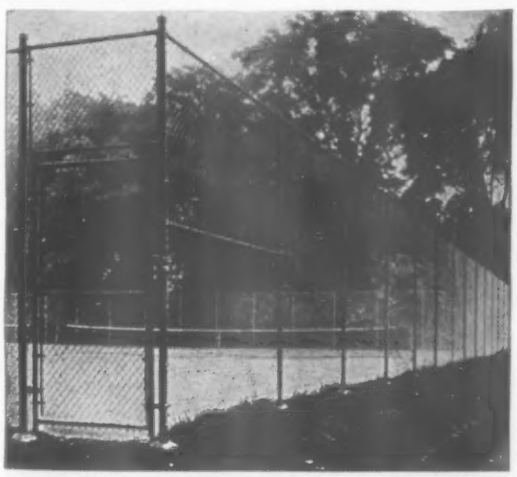
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This index covers only the present Volume XVIII (1946) and Volumes XVII (1945), XVI (1944), XV (1943), XIV (1942), XIII (1941), XII (1940), and XI (1939). A cumulative index to the previous Volumes, I through X, was published in Volume X.

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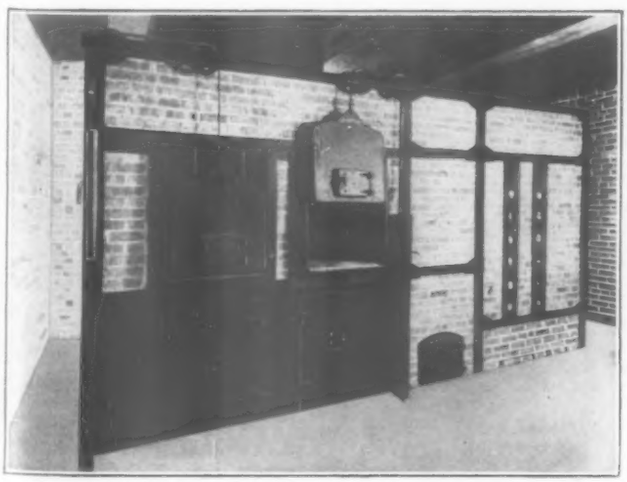
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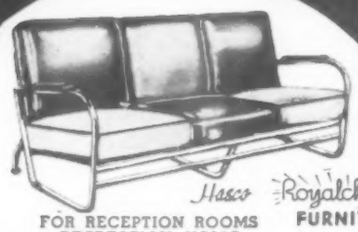
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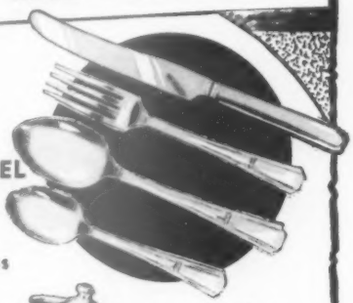
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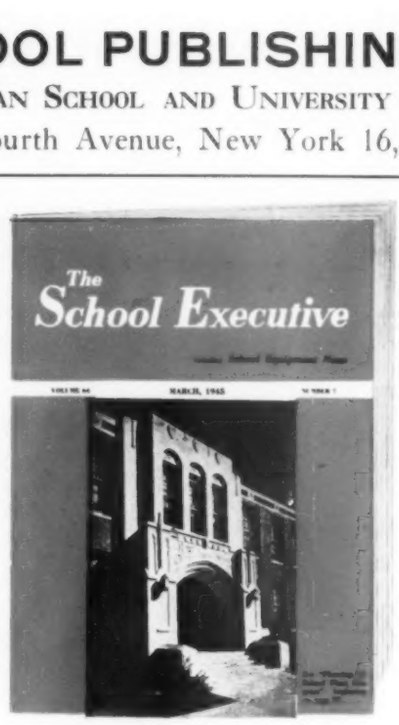
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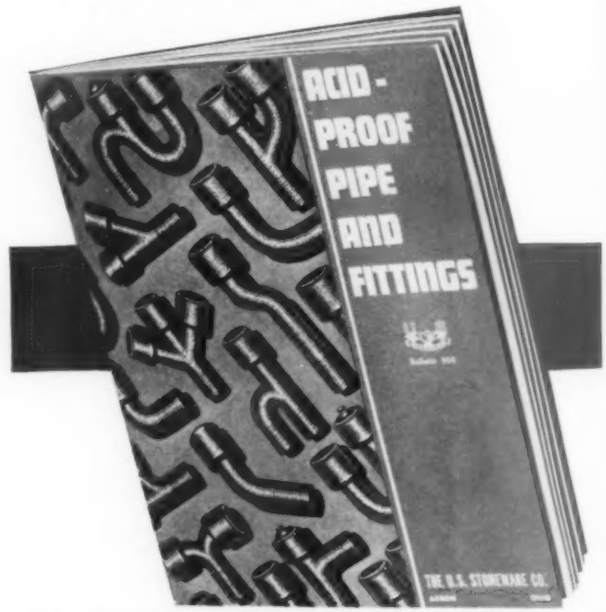
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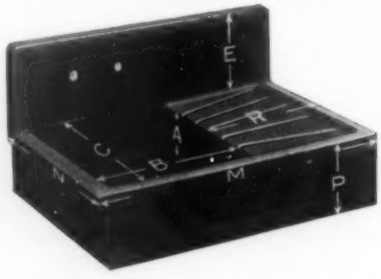
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307	18	14	7	8	37½	16½	8⅞	18	197	Tong
312	20	16	7	10	39⅜	19	9⅛	18	285	Tope
313-A	24	18	8	10	43¾	21	10⅛	18	348	Tory
315	30	20	8	10	49⅜	23	10⅛	18	410	Tuch

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507	18	14	7	8	54	16½	8⅞	18	284	Trew
512	20	16	7	10	56	19	9⅛	18	402	Trig
513-A	24	18	8	10	60	21	10⅛	18	477	Trow
515	30	20	8	10	66	23	10⅛	18	546	Tude

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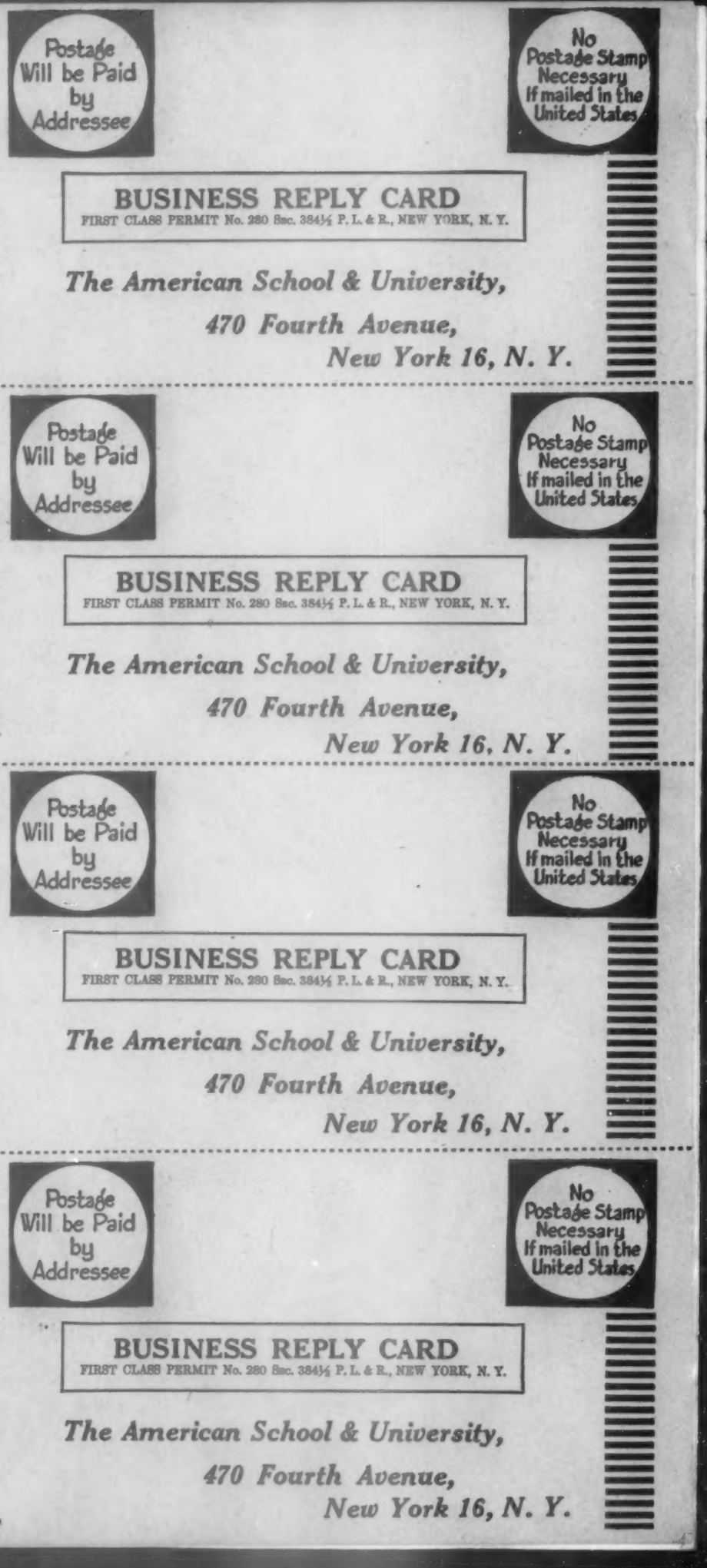
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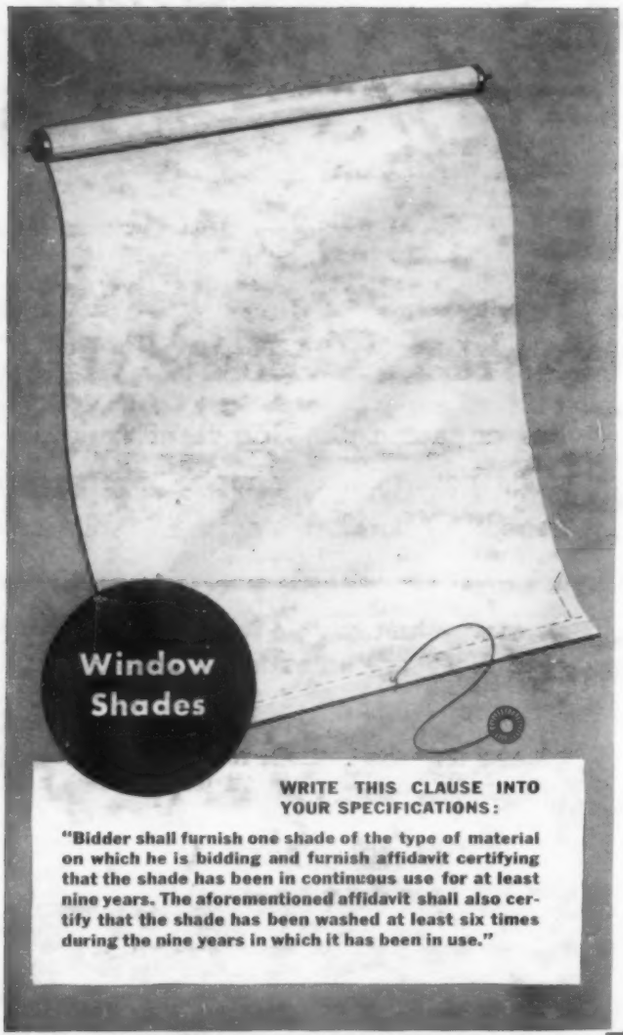
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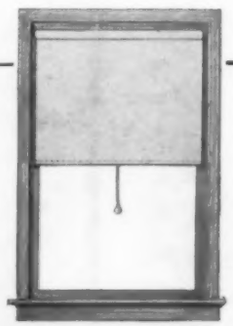
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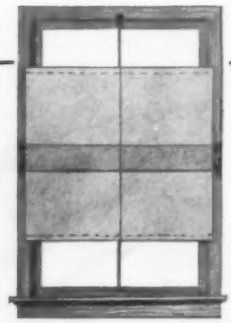
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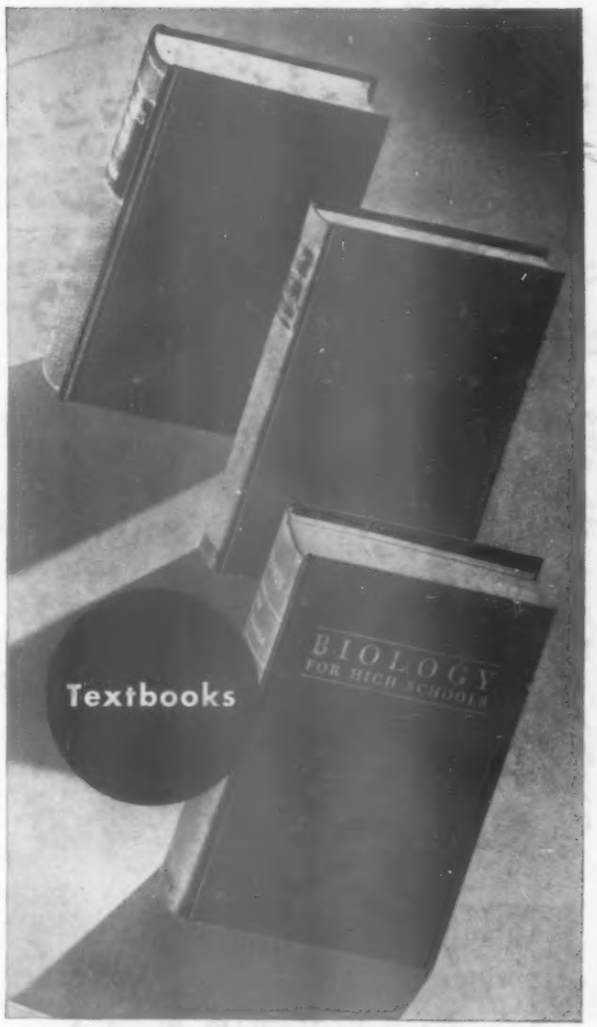
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